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Research Article

Anterior Belly of Digastric Transfer: New Treatment Modality for Adults with Congenital Hypoplasia of Depressor Anguli Oris

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Abstract

Background: Among many causes of asymmetrical smile in newborns, congenital hypoplasia of the depressor anguli oris muscle (DAO) is among rare ones. This asymmetry may continue to adulthood, as many patients may present with varying degree of smile animation discrepancies.

Objective: to show the efficiency of ant belly of digastric transfer for reanimation of lower lip in congenital depressor angulioris hypoplasia

Methodology: This case series comprises of 05 patients with congenital hypoplasia of depressor anguli oris muscle. These patients were not associated with other syndromes, congenital anomalies or paralysis of other branches of facial nerve. All were operated with the anterior belly of digastric mucle transfer (ABDMT).

Results: After mean follow up of 12 months, satisfactory outcomes were accomplished in all patients with all exhibiting improved symmetry during full mouth opening.

Conclusions: ABDMT proved to be most reliable method for restoration of depressor function which lead to excellent aesthetic and functional animation of lower face.

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Keywords | Congenital depressor anguli oris, Marginal mandibular nerve , Asymmetrical smile

Introduction

Incidence rate of congentital hypoplasia of depressor aguli oris (DAO) is 0.2%-0.6%, and affected patients are characterized by drooping of mouth corner at contralateral intact side while crying or mouth opening.[1-2] Affected individual's pathogenesis was first described by Parmalee as congenital unilateral hypoplasia of depressor anguli oris.[3] Later on, Cayler[4] presented five cases of congenital unilateral lip paresis associated with cardiac anomalies, which lead to extensive investigation criteria before undertaking any treatment modality. Most of the time diagnosis is done in clinical observation and proves to be the first step toward diagnosis and later on electromyography studies (EMG) provides confirmation, showing decreased motor unit potentials further confirming myogenic nature of deformity.[5] Congenital hypoplasia of DAO muscle can present as isolated anomaly without involvement of other systems but this can also be part of wide spectrum of abnormalities involving musculoskeletal, genitourinary and central nervous systems further complicating the situation.[3,6-10] Multiple methods for reanimation of lip are described, from balancing the asymmetry by selective mandibular neurectomy or myotomy of unaffected side to numerous static and dynamic means to reanimate the affected lip side.

Digastric muscle is a small paired muscle located in the anterior triangle of neck just under the platysma muscle. It comprises of two bellies with separate innervation and blood supply and attach to each other with an intermediate fibrous tendon, making it ideal for such transfer.

As shown in figure 1, Anterior belly originates from digastric fossa of mandible, innervated by mylohyoid nerve (branch of inferior alveolar nerve) and blood

supply is provided by submental branch of facial artery.[11] Posterior belly arises from mastoid notch of temporal bone, innervated by digastric branch of facial nerve and nutrient artery is supplied by lingual artery, branch of ext.carotid.[11] Both bellies are connected by intermediate tendon which itself encircled by the U-shaped fibrous sling on the superior border of hyoid bone. (Figure 1) Digastric provides two functions: depression of mandible when hyoid is fixed and elevation of hyoid bone and larynx when mandible is fixed.

In this study, we used anterior belly of digastric muscle to reanimate the lower lip. All patients had congenital hypoplasia of DAO.

Methodology

Total of 05 patients were included from outdoor department with complaint of facial asymmetry while smiling and mouth closing. All individuals were thoroughly examined and investigated for other associated anomalies and paresis of other branches of facial nerve.

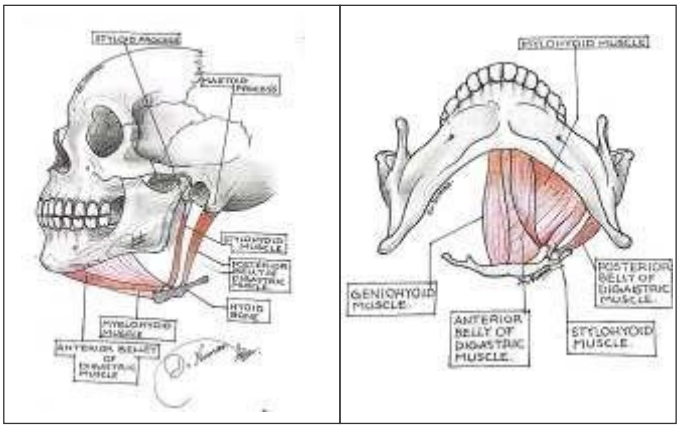

Figure 1: *Digastric muscle anatomy*

Operative technique. After marking (Figure 2) and infiltration of local anesthetic, incision was placed just above hyoid bone. After raising the flaps in subplatysmal plane, adequate exposure was made by fixing the flaps. After careful dissection, intermediate tendon was identified which is attached to hyoid bone. The U-shaped fibrous sling is released to mobilize. Then muscle was released by taking part of posterior belly. Flap was carefully released from mylohyoid muscle. Care was be taken to preserve neurovascular bundle which enters the flap from superomedial side. After completing flap elevation, recipient site is approached. After marking, local anesthetic with adrenaline infiltration was done. A small incision (app 2-2.5cm) given at vermillion border 1-2 cm medial to oral commissure, as shown in Figure 3.

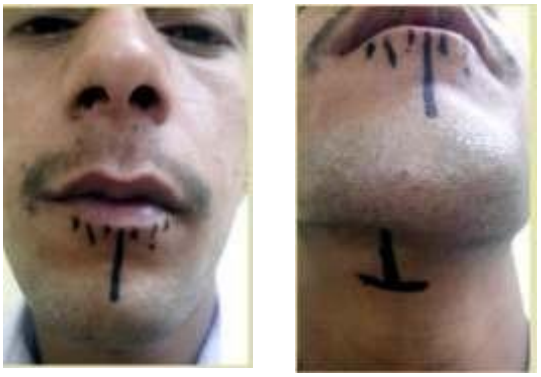

Figure 2: *Pre-operative marking*

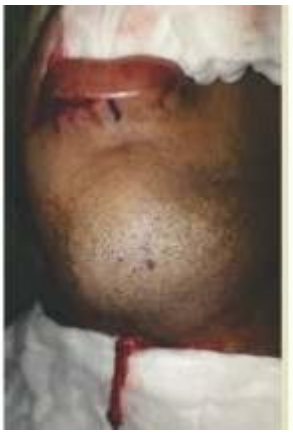

Figure 3: *Intraoperatively showing anterior belly of digastric muscle and incision over vermilion border for transfer.*

The muscle was mobilized & tunneled toward lip incision. The muscle part of post belly was spilt into 3 slings and sutured in three positions: lateral slip to oral commissure, medial slip to orbicularis oris muscle remaining middle slip just between medial and lateral slips as shown in Figure 4. The tension of repair was adjusted carefully so that lip margin began to move from resting position. A careful balance must be acquired between under and over correction as any such error can lead to unacceptable animation.

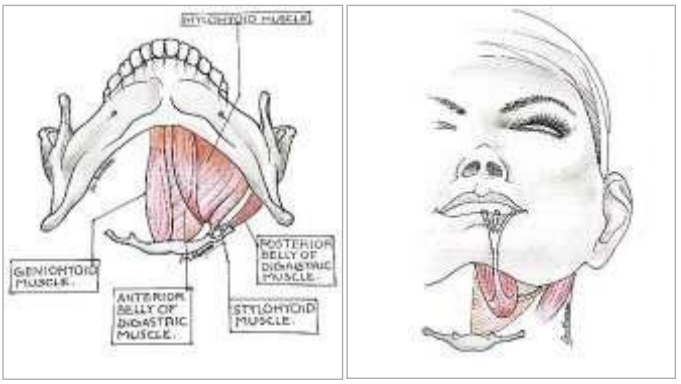

Figure 4:- *Muscle mobilization and insertion.*

Patients were followed up for 12 months at which time,

assessment of smile symmetry was done. A panel of 4 hospital staff was made. Members of panel were not familiar with details of surgery. Each person is assigned with a result sheet as shown in table 1, to score the improvement in patient. They were provided with pre- and post-operative photographs of patient in smiling and neutral position for determining the improvement and functional outcome.

Table 1: *score card for improvement in smile*

Score	Interpretation
0	No improvement
1	Improvement in smiling posture with lip close
2	Improvement in smiling posture with lips separate
3	Improvement in both smiling and crying pose

Results

Total number of patients was 5. There were 4 males and 1 female. The mean age of presentation was 22 years. Mean score of the sample was 2.2 based on the provided score card, yielding excellent results. This shows the efficiency of using anterior belly of digastric muscle in providing excellent animation in hypoplastic DAO muscle. Figure 5

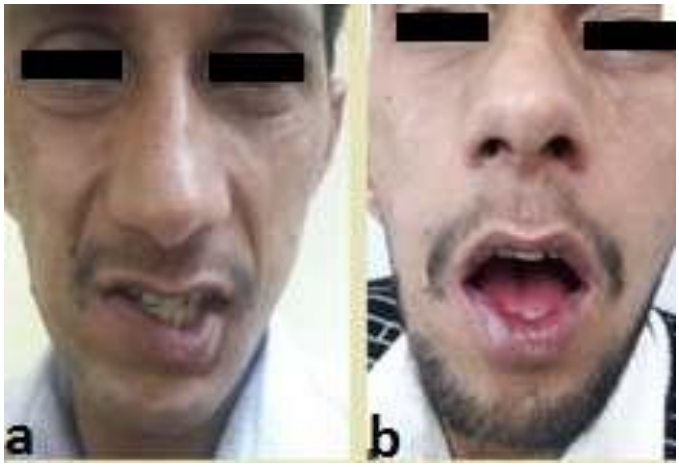

Figure 5: ***(a)*** *pre-op and* ***(b)*** *8th month follow-up after anterior belly of digastric transfer showing excellent symmetry*

Discussion

Congenital hypoplasia of DAO presents in early age as facial asymmetry which is more evident while smiling and eating, later on in adult life patient usually present with complaints of inability to close mouth and lopsidedness of affected side.[8] Care must be taken as this deformity could be associated with other congenital abnormalities. Cayler termed them as craniofacial syndrome in which wide array of congenital deformities are present from congenital cardiac defects to skeletal abnormalities.[4] It is also advised for such patients to undergo chromosomal analysis for screening of 22q11.2 microdeletion as incidence of this genetic abnormality is very high in such individuals as compared to general population.[15]

In adult age, congenital hypoplasia of anguli oris can be isolated finding but its diagnosis should lead to multidisciplinary team approach to investigate to exclude other congenital abnormalities. As incidence of associated major malformations in neonates is almost 10%, so neonates present with other complains in very early period.[12]

According to Lahet et al, the exact cause of congenital DAO hypoplasia is unknown. But there are multiple hypothesis from viral infection to intrauterine alteration. In another study conducted by Papadatos, in which 37 patients were followed back multiple generations and found affected ancestors among half of them, which lead to conclusions of strong autosomal dominant trait.[14]

There are conflicting studies regarding predominant side, some suggest right side[14,13] while in other authors reported dominance towards left side.[1,4] Out of our 5 patients. 4 presented with complain of facial asymmetry on left side while only one presented with right side.

There are multiple procedures advocated in past for this deformity. Yavuzer and Jackson[16] did a wedge excision from the hypoplastic side and defect is closed by advancing the muscle to the commissure creating a dynamic lip. In a study comprising of 74 patients, dynamic depressor muscle was created with platysmal transfer, direct neurotization etc.[17] Edgerton was the first one who used digastric muscle belly transfer in such cases. He used fascia lata slings, with one end attached to digastric muscle belly while other end is divided in two parts: one attached to commissure and other one just lateral to midline, and maintained tension in slightly overcorrection manner. This created a bidirectional pull but used tensor fascia lata slings.

Digastric transfer is a simple but effective way to give animation to lower lip. The digastric muscle is in close proximity to affected area and it can be sacrificed without any long-lasting effects. In our cases, we created three slings and sutured them to three points as we believe it creates more natural and strong animation. Secondly muscle is directly divided and mobilized so use of any fascial sling unnecessary, leading to decrease operative time and early hospital discharge. As results also indicate, a better dynamic lower lip animation can be achieved with this technique.

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Ammad Radul Ghumman: Article writing, contribution to the acquisition of data,

Muhammad Saleem: Idea and data collection

Muhammad Omar Afzal: Conception and design of the study, ana-lysis and interpretation

Zain ul Abidin: Article writing

Muhammad Umar Asif: Revision of the article and final approval of the article to be published

Farrukh Aslam Khalid: Conception and design of the study, analysis and interpretation

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Research Article

Salvage of Mangled Lower Extremity – Single Institution Experience

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Abstract

Background: Treatment of severe limb injuries remains controversial. Modern advances in resuscitation, free tissue transplantation, and fracture fixation have made these limbs salvageable although this is difficult and time-consuming. Various scoring systems have been proposed to predict the outcomes.

Objective: To describe our experience in salvaging mangled lower extremities at a tertiary care hospital. This Retrospective Cohort Study was conducted at the Department of Plastic Surgery Shifa International Hospital Islamabad Pakistan, from January, 2013 to December, 2022.

Methodology: All patients of either gender with the age range of 16 to 70 years, with mangled lower extremity who underwent limb salvage surgery, were included in this study. Radiological assessments were done preoperatively using X-rays, CT scans, and angiograms if indicated. These patients were assessed using The Mangled Extremity Severity Score (MESS) to assess their eligibility for salvage. A maximum score of 15 was summed. A score of < 7 was used as predictive of salvage.

Results: A total of 60 patients underwent limb salvage during this 10 year period. A significant proportion of mangled lower extremities were successfully salvaged (78.3%), while 21.7% required subsequent amputation. In terms of the mechanism of injury, 60% of cases were attributed to Road Traffic Accidents (RTA), 18.3% to Falls, 15% to Gun Shots, and 6.7% to Bomb Blast. From the pedicled flaps group, the gastrocnemius was performed in most cases, comprising 15% of total reconstruction, followed by soleus (10%). Free Latissimus Dorsi (LD) flap was used as free tissue transfer in 21%, followed by Free Anterolateral thigh (ALT) flap (10%).

Conclusion: The overall salvage rate for mangled lower extremities in the study was 78.3%. This suggests that irrespective of gender or mechanism of injury, salvage procedures were generally successful in a significant majority of cases.

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Keywords | Mangled Extremity, Salvage, Extremity reconstruction, Amputation

Introduction

The definition of mangled extremity is an upper or lower limb with an injury to at least three out of four cardinal structures (soft tissue, bone, nerves and vessels).[1] In the past mangled extremities were associated with a high rate of amputation. However recent advancements in resuscitation, fractured bone fixation and microvascular tissue transfer have made it possible to salvage the critical limb.[2] data show that amputation rate for mangled extremities has reduced from 72 to less than 10%.[3] Despite modern advancements, the management of mangled extremities is a challenging choice for the patient and the involved surgical team. Appreciation of the various factors in decision-making, potential risk factors, available reconstructive options and their functional outcomes are essential to positive patient outcomes.[4]

Blunt trauma is the most common mechanism of injury

for patients who present with a mangled extremity. In the civilian population significant number of these presentations are caused by Road Traffic Accidents, industrial accidents, falls, gunshots, and explosive injuries.[5] The most important factor is the amount of energy transmitted to the limb not the mechanism of injury. A meta-analysis concluded that lower limb salvage is more desirable than amputation psychologically to patients with mangled lower extremities.

Multiple scoring systems have been suggested in the past to help in the decision-making process of these complex extremity traumas. 1990 Johansen et al. introduced The Mangled Extremity Severity Score (MESS)[7]. Four distinct factors are scored; skeletal and soft tissue injury, shock, patient age and ischemia with a maximum score of 15. A score below 7 indicates a better prognosis and a score above 7 indicates a higher risk of amputation.[8,9]

This study aimed to identify the problem and gap in knowledge by fostering a holistic understanding of the challenges and opportunities associated with limb salvage to contribute to the ongoing evolution of best practices in the field in our local population, ultimately enhancing patient outcomes and facilitating a higher standard of care for those affected by these traumatic injuries in our local population.

Methodology

This descriptive study was carried out in the Department of Plastic Surgery at Shifa International Hospital Islamabad Pakistan, from January 2013 to December 2022. Ethical approval (Ref No: IRB# 011-24) was acquired from the Institutional Ethical Committee. The study population was gathered by nonprobability, consecutive technique. A P-value of <0.05 was taken as a statistically significant finding. Patients with mangled lower extremities who underwent limb salvage surgery were included. Patients with concomitant life-threatening injuries were excluded.

All selected patients were asked for written informed consent regarding their data utilization. Initial clinical findings along with the Radiological findings including preoperative imaging such as X-rays, CT scans, and angiograms were noted. The extent of soft tissue damage, vascular compromise, and bone injuries were documented which aided in surgical planning and decision-making. All patients were assessed using the Mangled Extremity Severity Score (MESS), patient who had a score of < 7 were planned for limb salvage. After that salvage procedures were carried out, including the surgeries for involved structures (e.g., debridement, vascular repair, bone fixation, soft tissue reconstruction). Surgical time, blood loss, and intraoperative complications (if any) were documented.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 23.0. Mean + SD was obtained for quantitative variables. Qualitative variables were recorded as frequencies and percentages. The chi-square test was applied keeping a p-value < 0.05 as the significance level.

Results

A total of sixty patients underwent limb salvage in this duration. The mean age was 34.87+16.381 years. The mean MESS Score was 6.70+1.934. The study population predominantly consisted of males, comprising 71.7%, while females constituted 28.3%. In terms of the mechanism of injury, 60% of cases were attributed to Road Traffic Accidents (RTA), 18.3% to Falls, 15% to Gun Shots, and 6.7% to Bomb Blast. Surgical interventions encompassed debridement and wound closure and/or skin grafting in 21.7%. Soft Tissue Reconstruction with Local or free flap in 78.3%. A significant proportion of mangled lower extremities were successfully salvaged, with 78.3%, while 21.7% required amputation. (Table-1).

From the pedicled flaps group, the gastrocnemius was performed in the majority of cases, comprising 15%

Table 1: *Demographic and Clinical characteristics of patients (n=60)*

Quantitative Variables	Mean+SD
Age (Years)	34.87±16.381 Years
MESS Score	6.70±1.934 Score
Qualitative Variables	
Gender, n (%)	
Male	43 (71.7%)
Female	17 (28.3%)
Mechanism of Injury, n (%)	
RTA	36 (60.0%)
Fall	11(18.3%)
Gun Shots	9 (15.0%)
Bomb Blast	4 (6.7%)
Type of Surgery, n (%)	
Debridement and closure or STSG	13 (21.7%)
Soft tissue Reconstruction	47 (78.3%)
Mangled Lower Extremity Salvaged, n (%)	
Yes	47 (78.3%)
No	13 (21.7%)

of total reconstruction, followed by soleus (10%). Free Latissimus Dorsi (LD) flap was used as free tissue transfer in 21%, followed by Free Anterolateral thigh (ALT) flap (10%). (Table- 2)

Table 2: *Types of Soft Tissue Flap Reconstruction*

Type of Flap	n (%)
Gastrocnemius	9 (15%)
Soleus	6 (10%)
Propeller Flap	4 (6%)
Sural Flap	3 (5%)
Other Local Flaps	6 (10%)
Free LD Flap	13 (21%)
Free ALT Flap	6 (10%)
No Flap required	13 (21.7%)

Our study explored the relationship between the mechanism of injury and the success of mangled lower extremity salvage procedures. The distribution of mechanisms of injury included RTA, Fall, Gun Shot, and Bomb Blasts. The salvage rates varied slightly across different mechanisms of injury. Sixty-six percent of the mangled lower extremity from RTA, 14.9% from fall, 12.8% from Gun Shots and 6.4% from Bomb Blast were recorded. (Table-3) However, the p-value of 0.33 suggests that these observed differences in salvage rates among different mechanisms of injury are not statistically significant. Therefore, based on the available data, there is no strong evidence to suggest a significant association between the mechanism of injury and the outcome of mangled lower extremity salvage procedures.

Our study noted the relationship between gender and the success of mangled lower extremity salvage procedures. The majority of participants were male (73.3%), and the overall salvage rate was 78.3%. The analysis by gender revealed that 81.4% of mangled lower extremities were salvaged in males, and 70.6% were salvaged in females. However, the p-value of 0.360 indicates that this observed difference in salvage rates between genders is not statistically significant. Therefore, based on the available data, there is no strong evidence to suggest a significant association between gender and the outcome of mangled lower extremity salvage procedures. (Table-4).

Table 4: *Association of Mangled Lower Extremity Salved with Gender (n=60)*

		Gender		Total	p-value
		Male	Female		
Mangled Lower Extremity Salvaged	Yes	35	12	47	0.360
		81.41%	70.6%	78.3%	
	No	8	5	13	
		18.6%	29.4%	21.7%	
Total		43	17	60	
		100.0%	100.0%	100.0%	

Discussion

High-energy open fractures from RTA, falls, Gun Shots, bomb blasts and crush injuries to the lower limbs presenting in the trauma room, the clinical decision to either attempt limb salvage or to proceed with a primary amputation, are common challenges to trauma surgeons.[10] The first step in the management of severely injured limbs starts with resuscitation and stabilization of the patient following the ATLS protocols and addressing any life-threatening injuries.

On the Trauma Call, our Trauma Team of an Orthopedic Surgeon, a Plastic Surgeon and a Vascular Surgeon is mobilized to receive the patient in the resuscitation area. A team approach in the early presentation of the patient and decision-making for life over a limb and possibly functional outcome of the mangled lower extremity is recommended.[11]

It was presented in a previous study that early debridement of devitalized tissue is a vital part of the management of the mangled lower extremity in reducing the risk of infection and tissue hypoxia.[12] A second and third look debridement was carried out if required, before proceeding for the definitive wound closure. All necrotic muscles were excised adequately as it can risk a patient's life shortly if left intact.[13]

Timing of the wound closure or reconstruction is very

Table 3: *Association of Mangled Lower Extremity Salvaged with Mechanism of Injury (n=60)*

			Mechanism of Injury				Total	p-Value
			RTA	fall	Gun Shots	Bomb Blast		
Mangled Lower Extremity Salvaged	Yes	Count	31	7	6	3	47	0.330
		% within Mangled Lower Extremity Salvaged	86..1	63.6	66.7	75.0	78.3	
	No	Count (n)	5	4	3	1	13	
		% within Mangled Lower Extremity Salvaged	13.9%	36.3%	33.3%	25.0%	21.7%	
Total		Count	36	11	9	4	60	
		% within Mangled Lower Extremity Salvaged	60.0%	18.3%	15.0%	6.7%	100.0%	

important. Our patients underwent definitive closure between 7 to 10 days. Godina14 favored the early wound closure with a well-vascularized tissue in 1986. Byrd et al.[15] reconstructed open tibial fractures with muscle flaps in the first five days. Another study[16] was conducted in 2018 favoring Godina's Principles of early reconstruction of the lower limb.

In our study, almost all patients underwent Vacuum Assisted Closure (VAC) therapy before the definitive procedure as DeFranzo et al.[17] has demonstrated VAC in lower extremity injuries. It promotes the formation of granulation tissue and increases blood flow to the injury site.[17]

For definitive reconstruction, the Gastrocnemius muscle was the most common flap for lower limb reconstruction in our study and Soleus was used mainly for proximal and middle thirds of the leg wounds, study by AlMugaren et al[18] has described the same findings. Propeller flaps were used for small to moderate size soft tissue defects in the lower limb.[19] Free flaps were designed for distal and large-size defects. LD muscle or fasciocutaneus free flap was suitable for large defects as it has the advantage of its long-size pedicle. Other common free flaps available for lower extremity reconstruction are ALT Flap, Rectus Abdominus Flap, Radial Forearm Flap, and Gracilis Flap.

We have learned from our experience that free LD muscle flap atrophies with time matching the contour although it looks bulky at the immediate post-op period. In our study 13 (21%) Free LD muscle flaps were employed that resulting in an excellent contour match. Osteomyelitis is a common complication for open fractures and early reconstruction of the defect with a muscle flap decreases the risk of developing this unsettling complication.[20]

In cases of mangled lower extremities, a meta-analysis comparing amputation with limb salvage revealed that patients with limb salvage did better psychologically than amputees, but there was no difference in biological outcomes.[21] After two and seven-year follow-ups, the Lower Extremity Assessment Project (LEAP) study showed no difference in functional outcomes between limb salvage and amputation patients.[22] The Military Extremity Trauma Amputation/Limb Salvage (METALS) study contradicts from LEAP study. It included 324 service members who had lower limb injuries and were either amputated or had their limbs salvaged. It was a retrospective cohort study. Amputees in this study not only performed better on functional assessments, but they were also able to engage in more strenuous physical activity than those who received limb salvage.[23]

However, amputations are major life-altering operations that necessitate substantial functional adaptations on the part of the patient. Consequently, it is critical to use a multidisciplinary approach that takes these factors into account when determining surgical treatment options for patients with complicated limb injuries. From the very beginning, the patient should be included in making therapeutic decisions, and their desires should always be honored by the management team.

It is essential to acknowledge the potential limitations of this single-center retrospective study such as the sample size, limited follow-ups, and any unaccounted confounding variables. A larger sample size under randomized control trials may provide more robust and generalizable findings.

Conclusion

The overall salvage rate for mangled lower extremities in the study was 78.3%. This suggests that irrespective of gender or mechanism of injury, salvage procedures were generally successful in a significant majority of cases. The study underscores the importance of a comprehensive and multidisciplinary approach to mangled lower extremity injuries. Factors beyond gender or mechanism of injury, such as individual patient characteristics, may play crucial roles in determining salvage success.

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Author's Contribution

The following authors have made significant contributions to the manuscript as under:

Dr. Shah Zaib Aslam; Conception and design of the study, data collection, analysis and interpretation

Dr. Muhammad Ibrahim Khan; Critical revision of the article and final approval of the article to be published

Dr. Adeela Hussain Khan; Critical revision of the article and final approval of the article to be published

Dr. Rashmeen Khan Afridi; Substantial contributions to the acquisition, analysis and interpretation of data

Dr. Farwa Shabbir; Substantial contribution to acquistion, analysis and interpretation of data

Dr. Mamoona Gohar; Substantial contributions to the acquisition of data, critical review

The authors undertake to take full responsibility for the work and to make sure that any concerns about the integrity or correctness of any portion of the work are duly looked into and addressed.

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Research Article

Radial Nerve Injury in Patient Presenting with Closed Fracture of the Shaft of Humerus

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Abstract

Background: Radial nerve injury may be the result of neuropraxia, nerve laceration, or entrapment of the nerve between the fracture fragments. This study will also provide us with local statistics regarding radial nerve injury humeral shaft fracture as no local studies were found on this topic.

Objective: The study aims to determine the frequency of radial nerve injury in closed humeral shaft fractures.

Methodology: A total of 89 patients with the age between 20-60 years, irrespective of gender having closed humeral shafts fractures were recruited. Standard ward protocols for the management of patients were followed including stabilization of fracture and analgesia administration. All patients were assessed under the supervision of an expert orthopedic surgeon for radial nerve injury based on wrist drop with the inability to extend wrist fingers and thumb.

Results: The range of age of patients in this study was from 20 to 60 years having a mean of 38.89 ± 7.89 years. Most of the patients 47 (52.81%) were between the ages of 20 to 40. Out of the 89 patients, 53 (59.55%) were male and 36 (40.45%) were females. The ratio between males and females was 1.5:1. The percentage of injury to the radial nerve in patients with a closed humeral shaft fracture was 25.84%, affecting 23 patients, while those without injury to the radial nerve numbered 66 (74.15%).

Conclusion: This study concluded that the frequency of injury to the radial nerve in patients having closed humeral shaft fracture is 25.84% .

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Keywords | Closed Fracture, Humerus Shaft, Radial Nerve Injury.

Introduction

Around 80% of all proximal humerus fractures are either minimally displaced or not displaced at all, and are therefore, mostly managed non-operatively.[1] Distal humeral fractures are linked with fractures of the ipsilateral proximal forearm. Nerve or vascular injuries are uncommonly connected with humerus fractures. Humerus fractures have the following mechanism of occurrence, direct trauma to the arm, direct trauma to the shoulder, or axial loading transmitted by the elbow.[2]

Stress fractures of the humerus develop as a result of overhead throwing and, on rare occasions, severe muscular spasms. Baseball players are prone to these sorts of fractures. The major causes, like with other stress fractures, are increased activity or stress on immature or unconditioned bone.[3] Due to its closed contact in the spiral groove across the back of the mid-shaft of the humerus, its spiral course, and a fixed position in the distal arm where it penetrates the lateral intramuscular septum anteriorly, the radial nerve is most frequently injured in fracture of the humeral shaft. Radial nerve palsy can either be primary i.e., occurring at the time of injury (primary) or (secondary) i.e., occurring during reduction.[4] Concerning the type and size of humeral

shaft fracture we have many opinions about treatment of radial nerve injury.[3] Radial nerve injury may be the result of neuropraxia, nerve laceration, or entrapment of the nerve between the fracture fragments. The closed fracture of the shaft of the humerus with wrist drop is mainly treated non-operatively with closed reduction under an image, applying a U-slab cast and dynamic wrist drop splint for radial nerve palsy, has a good overall outcome.[4]

There are different statistics related to the incidence of primary radial nerve injury in the literature. The incidence of injury to the radial nerve is 12%, in closed mid-shaft humeral fracture.[5] Another study reported an incidence of radial nerve injury as 17.9% in humeral shaft fractures.[6] While the fracture of the spiral groove, also known as sulcus nervi radialis (SNR) has an incidence of radial nerve injury, as high as 37.5%.[7] In another study performed the number of radial nerve injury in patients having shaft spiral fracture of the humerus, also called Holtein-Lewis type fracture, was 22%.[8]

This paper aims to investigate the connection between radial nerve injury and closed humeral shaft fractures, common orthopedic injuries encountered in clinical practice. Radial nerve damage in the context of humeral shaft fractures can lead to significant functional impairment. Therefore, prompt diagnosis and appropriate management are crucial to optimize patient outcomes. By examining the prevalence, risk factors, and clinical implications of radial nerve injury in this patient population, the study will better understand the complex relationship between the radial nerve and humeral shaft fractures, ultimately guiding healthcare.

Methodology

This descriptive cross-sectional study was conducted at the Departments of Orthopedic Pak International Medical College, Hayatabad, Peshawar, and Khyber Teaching Hospital, Peshawar from 31st May 2021 to 30th November 2022. The inclusion criteria were either gender of patients between the age 20-60 presenting to ER or OPD with closed fracture of humerus while the exclusion criteria were open fractures of humerus, polytrauma patient with multiple fractures involving the same limb, pathological fracture of humeral shaft, and a history of having neurological deficit in the same limb. Consent forms from patients/guardians and ethical approval were also obtained from the hospital before conducting the study (Ref No. 01/DMR/PIMC).

All patients were assessed with detailed clinical examination and history. Standard ward protocols for the management of patients were followed including stabilization of fracture and analgesia administration. All patients were assessed under the supervision of an expert orthopedic surgeon for radial nerve injury based on wrist drop with the inability to extend wrist fingers and thumb. To control confounders and bias in the study outcomes, the aforementioned data, including name, gender, and age, were recorded in a pre-designed proforma and the exclusion criteria were rigorously adhered to.

All data were initially entered in Microsoft Excel 2016 and then further analyzed through Statistical Package for Social Sciences version 22 (SPSS 22). Descriptive analysis was applied and frequency along with percentage were shown in tables and figures. P-values less than 0.05 were considered statistically significant.

Results

In a total frequency of 89, the distribution of patients according to the type of trauma as follows: traffic road accident 50 patients (56.18%), fall-related injuries account for 25 patients (28.09%), and violence-related injuries account for 14 patients (15.73%). The distribution concerning the type of fracture is as follows: 21 patients (23.60%) have spiral fractures, 19 patients (21.35%) have comminuted fractures, 32 patients (35.96%) have segmental fractures, and 17 patients (19.10%) have transverse fractures. Regarding the site of the fracture, the distribution is as follows: 12 patients (13.48%) have proximal fractures, 59 patients (66.29%) have middle fractures, and 18 patients

Table 1: *Distribution of Patients with closed fracture of the shaft of Humerus (n=89) with respect to the type of trauma, type of fracture and site of fractures*

Distribution with respect to type of trauma		
Parameters	**Frequency**	**Percentage (%)**
Road traffic accident	50	56.18
Fall	25	28.09
Violence	14	15.73
Distribution with respect to type of fracture		
Parameters	**Frequency**	**Percentage (%)**
Spiral	21	23.60
Comminuted	19	21.35
Segmental	32	35.96
Transverse	17	19.10
Distribution with respect to the site of fracture		
Parameters	**Frequency**	**Percentage (%)**
Proximal	12	13.48
Middle	59	66.29
Distal	18	20.22

(20.22%) have distal fractures as shown in Table 1. Frequency of patient with and without radial nerve injury in closed humeral fracture is shown in Table 2.

Table 2: *Frequency of injury to the radial nerve in patients with and without radial nerve injury.*

Total Frequency	Patient with Radial nerve injury	Patient without Radial nerve injury
89	23 (25.84%)	66(74.15%)

The range of age of patients in this study was from 20 to 60 years with a mean age of 38.89 ± 7.89 years with most of the patients 47 (52.81%) between 20 to 40 years of age. Out of the 89 patients, 53 (59.55%) were male and 36 (40.45%) were females. The ratio between male to female was 1.5:1. Stratification of radial nerve injury for age groups, gender, and type of trauma, type of fracture, and site of fracture (Table 3).

Table 3: *Frequency of injury to radial nerve in patients having closed humeral shaft fracture (n=89).*

Stratification of injury to radial nerve with respect to age groups.			**Total**
Age	**Radial nerve injury present**	**Radial nerve injury absent**	
20-40	16 (69.6%)	31 (47%)	47 (52.8 %)
41-60	07 (30.4%)	35 (53%)	42 (47.2%)
Stratification of radial nerve injury with respect to gender			**Total**
Gender	**Radial nerve injury present**	**Radial nerve injury absent**	
Male	14 (60.8%)	39 (59.1%)	53 (59.5%)
Female	09 (39.2%)	27 (40.9%)	36 (40.5%)
Stratification of radial nerve injury with respect to type of trauma			
Type of trauma	**Radial nerve injury present**	**Radial nerve injury absent**	**Total**
Road traffic accident	19 (82.6%)	31 (46.9%)	50 (56.1%)
History of fall	02 (8.6%)	23 (34.8%)	25 (28.1%)
Violence	02 (8.6%)	12 (18.7%)	14 (15.8%)
Stratification of radial nerve injury with respect to type of fracture			
Spiral	03 (3.3%)	18 (27.2%)	21(23.59%)
Comminuted	09 (10.1%)	10 (15.15%)	19(21.34%)
Segmental	04 (4.5%)	28 (42.42%)	32 (35.9%)
Transverse	07 (7.9%)	10 (15.15%)	17 (19.1%)
Stratification of radial nerve injury with respect to site of fracture			
Site of fracture	**Radial nerve injury present**	**Radial nerve injury absent**	**Total**
Proximal	04 (17.39%)	08 (12.12%)	12 (13.4%)
Middle	11 (47.8%)	48 (72.72%)	59 (66.2%)
Distal	08 (34.7%)	10 (15.15%)	18(20.22%)

Discussion

Fractures of the shaft of the humerus are very common with reported cases of more than 237,000 each year. Humeral shaft fractures have a bimodal distribution mostly occurring in males under 25 years of age and in women above 50 years of age.[9]

Primary, secondary, and delayed radial nerve palsies can be either partial or total. Occurring during the treatment of fractures, secondary radial nerve palsies cause more than 20% of all nerve palsies.[9] 87.3% of patients with primary radial nerve palsies resolve spontaneously, though a more aggressive treatment involving early exploration has been suggested to improve time to functional recovery.[9]

In our study, the frequency of injury to radial nerve in patients having closed humeral shaft fracture was found in 23 (25.84%) patients and those without injury to the radial nerve is 66(74.15%). Another study reported the incidence of injury of radial nerve as 12%, in the closed mid-shaft and distal-mid shaft fractures.[10] with nerve injury more common in spiral and transverse fractures compared to comminuted and oblique fractures.[11] Another study reported an incidence of radial nerve injury as 17.9% in humeral shaft fractures.[6] Another study reported the fracture of the spiral groove, also known as sulcus nervi radialis (SNR) has an incidence of radial nerve injury, as high as 37.5%.[12] In another study performed by Ekholm et al., the frequency of injury to radial nerve in patients having spiral humeral shaft fracture, also called Holtein-Lewis type fracture, was 22%.[8]

Various studies report an incidence of radial nerve palsy ranging from 1.8%[13] to 35.3%[12,13] and a good recovery rate of 31 % (Sim et al.,)[14] to a poor recovery rate of 0% (Pollock et al.,).[15] Our study reported an incidence of primary radial nerve palsy of 25.84% which is high compared to other literature which can be since our hospital is a tertiary care health center and thus receives more complex cases.

In our study, out of the 89 patients, we had 53 (59.55%) males and 36 (40.45%) females. The ratio between males and female was 1.5:1. Studies indicate that men are more likely to injure their upper extremities, especially the radial nerves due to issues like driving accidents, occupation, and insignificant safety issues more than women.[16]

Level of fracture also played a significant role in injury to the radial nerve i.e. 32% in the lower one-third of the

humeral shaft, 64% in the middle one-third, and 4% in the upper one third which is comparable to Bostman et al.,[17] Most of fractures involving the middle third of the humerus caused radial nerve palsy because radial nerve lies in close contact with humerus in the spiral groove level making it more prone to injury.[18]

Fracture pattern was comminuted in 39% (n=9/23) of cases, spiral in 13.0% (n=3/23), transverse in 30.4% (n=7/23), and oblique in 40% of cases which is again comparable to Bostman et al.,[17] In Comminuted fractures, the limb segment absorbs high energy at the site of injury resulting in direct radial nerve damage while transverse fracture is mostly angulated laterally causing indirect damage to the radial nerve by either stretching across the fracture site or impingement of fracture fragments. 36% population showed associated injuries mainly occurring in population involved in road traffic accidents.[19] Nerve continuity was intact in all cases requiring no surgical repair. One patient recovered within 5 weeks showing a pattern of neurapraxia while others recovered between 16 -50 weeks showing a pattern of axonotmesis. The average time of complete recovery was 22 weeks in our study while the literature showed recovery time of 15 weeks. This can be because most cases in our study had axonotmesis-type injury patterns.[6]

There are two groups of radial nerve injury based on time of injury i.e., primary and secondary. In primary injury function is lost at the time of injury, and occurs mainly in closed fractures. In the secondary injury, function is lost due to conservative management or entrapment of the nerve in the fracture segment, as well as following surgery.[19,20] Published literature indicates that in patients undergoing surgery for fracture stabilization, secondary damage occurs in 4% to 32%.[21]

There is substantial data indicating conservative management of radial nerve palsies due to humeral shaft fractures because of the high rate of spontaneous recovery.[22] However, high-velocity gunshot wounds, open fractures, vascular injuries, or extensive soft tissue injury should be managed with early surgical exploration of the nerve.[9,23]

Conclusion

This study found that patients with closed humeral shaft fractures had a 25.84% prevalence of radial nerve damage. Therefore, it is recommended that proper evaluation of patients with fractures of the shaft of the humerus should be done for radial nerve injury to take timely management for reducing the morbidity of these particular patients.

Author Contributions

The following authors have made significant contributions to the manuscript as under:

Farhan Qazi: Conception, Study Design, Data Acquisition, And Final Approval

Anwar Imran: Manuscript Drafting, Data Analysis, And Final Approval

Mudir Khan: Conception, Study Design, Manuscript Revising, And Final Approval

Sajid Akhtar: Data Collection, Interpretations Of Results, And Final Approval

Muhammad Abubakr: Data Collection, Revising Manuscript, And Final Approval

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Research Article

Role of Tranexamic Acid in Intraoperative Blood Loss and Postoperative Edema and Ecchymosis in Primary Elective Rhinoplasty: A Randomized Controlled Trial

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Abstract

Background: Rhinoplasty often involves significant bleeding and postoperative complications. Tranexamic acid (TXA) may reduce these issues. This study evaluates the effect of preoperative TXA on blood loss, surgery duration, and postoperative complications in rhinoplasty patients.

Objective: To compare blood loss during surgery, edema, and ecchymosis after surgery in patients administered with TXA or normal saline undergoing primary elective rhinoplasty.

Methodology: Sixty-eight patients requiring rhinoplasty were included in this randomized control trial (RCT). Thirty-four patients received TXA 20 ml preoperatively (Group-A) while thirty-four received 0.9% normal saline (Group-B). Outcomes between both groups were assessed in terms of surgery duration, intraoperative bleeding, edema, and ecchymosis between both groups.

Results: All the patients completed the study. The mean age in group A was 33.59±9.25 years while 31.21±9.22 years in group B. The duration of surgery in group A turned out to be 103.38±10.37 mins while in group B it was 120±11.31 mins with notably reduced duration of surgery in group A(P = 0.0001). Group Ashowed notably lower intraoperative blood loss (148.88±30.75) ml as compared to the placebo group which received normal saline (180.44±24.75 ml, P = 0.0001). The incidence of postoperative edema and ecchymosis compared to the placebo group was significantly lower.

Conclusion: Preoperative tranexamic acid lowers postoperative side effects such as edema and ecchymosis and greatly reduces blood loss and shortens surgery duration in patients undergoing rhinoplasty.

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Keywords | Rhinoplasty, Edema, Blood loss, Tranexamic acid, Ecchymosis

Introduction

Rhinoplasty is one of the foremost aesthetic surgical operations. Conducting a thorough preoperative clinical assessment, which encompasses an examination of Naso-facial proportions and a systematic investigation of the nasal structure, is of paramount importance as the primary stage in achieving a satisfactory outcome in rhinoplasty procedures.[1] Tranexamic Acid (TXA) is a pharmacological agent with antifibrinolytic properties. Its primary mode of action involves the disruption of the coagulation cascade by inhibiting the synthesis of plasmin, hence promoting the stabilization of platelet plaques. This outcome is accomplished through the utilization of a synthetic derivative of the amino acid lysine, which effectively binds and competitively obstructs plasminogen molecules. Consequently, this process successfully impedes the destruction of pre-existing plaques.[2,3]

Numerous therapies have been identified as effective in mitigating eyelid edema and ecchymosis after rhino-

plasty.[4] Tranexamic acid functions as an antifibrinolytic drug by inhibiting the binding of lysine to plasminogen, hence diminishing the localized breakdown of fibrin by plasmin.[5] Several systematic reviews and meta-analyses have been published, providing robust evidence that the use of tranexamic acid is linked to decreased bleeding in various surgical procedures.[6-9] Although tranexamic acid has been used intravenously and orally in surgical procedures, there is a limited body of research specifically investigating the oral administration of this drug in rhinoplasty surgery.[10,11] A study reported the mean intraoperative bleeding in the tranexamic acid group 213+65 mL, and in the normal saline group 254 + 55 mL, ecchymosis was observed in 25% in the normal saline group, and 3.8% in the tranexamic acid group, edema was observed in 29.2% in the normal saline group and 3.8% in tranexamic acid group patients' undergone rhinoplasty.[12]

Mitigating the potential for complications is a paramount necessity in every surgical intervention. Patients who are receiving elective rhinoplasty surgery necessitate a sense of assurance regarding the anticipated results of their procedure, along with a minimized likelihood of experiencing any complications. The current study was conducted to assess the efficacy of tranexamic acid in minimizing difficulties associated with elective rhinoplasty, hence alleviating the associated anxiety and panic experienced by patients. The findings of this study could potentially provide a therapeutic approach that enhances the favorable effects of the process, hence increasing the number of patients who choose this way to improve their health outcomes.

Methodology

Amulticentric randomized controlled trial was conducted. Both hospital's ethical board gave its approval before the study could be carried out. The study duration was six months from March, 2023 to September, 2023. The calculation of sample size is performed by using the WHO sample size calculator, keeping the mean intraoperative blood loss in the tranexamic acid group undergone rhinoplasty (213+65 mL) and keeping the mean intraoperative bleeding in the normal saline group undergone rhinoplasty (254 + 55 mL), power 80% and confidence level 95%.[12] A total of 68 patients aged 18 to 50 years undergoing primary elective rhinoplasty for cosmetic or reconstructive purposes were included. Patients were required to provide written informed consent outlining the goal of the study and reassuring them that there were no dangers associated with participating. All included patients met the specific surgical requirements for rhinoplasty. Patients with coagulopathies, hypertensive patients, and diabetes were excluded. Any patient with contradiction to use of TXA were also excluded.

Age, gender, and address were among the demographic details that were noted. The blocked randomization technique was used to evenly split patients undergoing elective rhinoplasty into two groups.

Group Areceived 20 mL (10 mg/kg) of tranexamic acid intravenously preoperatively, and Group B received normal saline 0.9%. All patients received 750 mg of cefuroxime and 8 mg of Dexamethasone intravenously at induction of anesthesia. Hypotensive anaesthesia was administered and local anaesthesia with the vasoconstricting agent (2% Xylocaine with adrenaline 1:10000) was injected. Standard surgical maneuvers were used to correct the specific requirement of each individual patients.

The procedure was conducted with double blinding to assess intraoperative blood loss, postoperative edema, and ecchymosis. The entire process was supervised by a consultant with at least five years of post-fellowship experience. All patient data were recorded in a pre-made proforma. All the patients were advised Serratiopeptidase as routine post-operative medicine. The duration of surgery was recorded in minute. The amount of bleeding that occurred during the surgery was calculated and recorded in milliliters (mL) using suction canisters and sponges. The amount of blood removed during surgery is determined by subtracting the quantity of irrigation fluid utilized during the surgery from the total amount of fluid collected in the suction canister at the conclusion of the surgery. The volume of blood absorbed by each 4×4 inch gauze during a procedure is computed by multiplying the number of gauze completely saturated with blood by 10 milliliters (an approximate average of blood absorbed per gauze). These two measurements were then combined to calculate the overall intraoperative blood loss. The quantity of blood collected during the operation in the group that received tranexamic acid was compared with that of the control group.[13]

Periorbital ecchymosis and edema were recorded at 48 hours postoperatively. The criterion for assessing periorbital ecchymosis scoring: 0 points indicate no extension; 1 point indicates extension towards the center; 2 points indicate extension up to the pupil; 3 points

indicate extension beyond the pupil; 4 points indicate extension up to the outer corner of the eye.14 for post operative edema around the eyelids scoring: 0 point indicates no presence, 1 indicates a modest amount, 2 indicates coverage up to the iris, 3 indicates reaching the pupil, and 4 indicates a significant amount of swelling with the eyelid closed.[15]

SPSS ver 23 was used for data analysis. The Chi-Square test along with the T-test was applied for the comparison of outcomes. P value was kept at < 0.05 as significant.

Results

The mean age in group A was 33.59±9.25 years while it was 31.21±9.22 years in group B. In group A male patients were 22 (64.7%) while female patients were 12(35.5%). In group B male patients were 20 (58.8%) while females were 14 (41.5%).

The outcomes in our study were assessed in terms of intraoperative blood loss, duration of surgery, edema, and ecchymosis. The duration of surgery in group A turned out to be 103.38±10.37 mins while in group B it was 120±11.31 mins with notably reduced duration of surgery in group A (P = 0.0001). Group A showed notably lower intraoperative blood loss 148.88±30.75 ml as compared to the placebo group which received normal saline 180.44±24.75 ml (P = 0.0001) as shown in Table 1.

Table 1: *Intraoperative bleeding (ml)*

	N	Mean	Std. Deviation	P value
Group A (TXA)	34	148.88	30.758	0.0001
Group B (Normal saline)	34	180.44	24.752	

Regarding the side effects such as ecchymosis and edema, it was observed that the TXA group showed a lower incidence of both side effects as shown in Table 2 and Table 3.

Table 2: *Postoperative Edema*

		Postoperative eyelid edema				Total	P value
		0	1	2	3		
Groups	Group A (TXA)	2	9	14	9	34	0.06
		5.9%	26.5%	41.2%	26.5%	100.0%	
	Group B (Normal saline)	0	2	10	22	34	
		0.0%	5.9%	29.4%	64.7%	100.0%	
Total		2	11	24	31	68	
		2.9%	16.2%	35.3%	45.6%	100.0%	

Table 3: *Postoperative ecchymosis*

		Ecchymosis				Total	P value
		0	1	2	3		
Groups	Group A (TXA)	1	7	18	8	34	0.02
		2.9%	20.6%	52.9%	23.5%	100.0%	
	Group B (Normal saline)	0	2	13	19	34	
		0.0%	5.9%	38.2%	55.9%	100.0%	
Total		1	9	31	27	68	
		1.5%	13.2%	45.6%	39.7%	100.0%	

Discussion

Due to the highly vascular area encountered in rhinoplasty, considerable blood loss may result from the procedure. Reducing the consequent need for blood transfusion is the main objective of most interventions, as blood transfusion can lead to various complications such as blood-borne infections and diseases.[16]

Research indicates that the use of Tranexamic Acid during surgery can significantly lower blood loss during and after the procedure. This finding has been observed in several surgical procedures.[17]

According to many recent meta-analyses, Tranexamic Acid has been shown to effectively reduce intraoperative blood loss.[18-23] Furthermore, TXA reduces bleeding in healthy people following third molar extraction surgery. Oral administration of TXA has a 50% lower gastrointestinal absorption than intravenous administration, and it may be linked to a lower risk of thromboembolic consequences. [24,25]

In our study, we observed a significant decrease in the intraoperative blood loss in the TXA group 148±30.75 ml as compared to the placebo group which received saline solution 180.44±24.75 ml. The results of this study demonstrate that, when compared to a placebo, the administration of 20 ml TXA can dramatically minimize intraoperative blood loss. Our study's outcomes were comparable to those of patients who received 1 g of oral TXA starting two hours before surgery and continuing for five days, undergoing functional endoscopic sinussurgerycombinedwithseptoplastyandconchotomy.

This review demonstrated in their analysis of various studies that TXA significantly reduces intraoperative blood loss and post-operative swelling.[26]

Another outcome parameter that we studied was the mean surgery time, the TXA group showed significantly lower mean surgery duration than the placebo group 103.38±10.37 vs 120±11.31 mins (P=0.001). A study found similar results in terms of lower duration of surgery in the TXA group as compared to the placebo

group.[27]

Postoperative ecchymosis and edema are considered to be the most common side effects of rhinoplasty, we observed that the frequencies of both side effects were notably lower in the TXA group as compared to the placebo group. Studies have shown that postoperative edema and ecchymosis were notably reduced in the TXA group.[12,27]

Conflict of interest: none

Source of funding: none

Conclusion

We find that preoperative tranexamic acid helps minimize surgical side effects including edema and ecchymosis and dramatically minimizes blood loss in patients undergoing rhinoplasty.

Author's Contribution

The following authors have made significant contributions to the manuscript as under:

Muhammad Raza Tahir: conception and design or analysis and interpretation of the data, actual write-up of manuscript

Farrukh Aslam Khalid: conception and design or analysis and interpretation of the data, actual write up of the manuscript, final approval of the version to be published

Muhammad Amin: interpretation of the data, drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search

Maruf Zahid: interpretation of the data, drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search

Rida Naeem: interpretation of the data, drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search

Hafsa Khalid: drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search

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Research Article

Lahore Wheel Spoke Injury Classification

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Abstract

Background: Pakistan has seen an increase in wheel spoke injuries of the foot as motorcycles become a more popular mode of transportation. The resulting injuries can range from minor abrasions to mangled feet that need to be amputated. Currently, there is no comprehensive classification that can categorize the wide range of injuries that have been observed.

Objective: This study aims to critically evaluate the classifications used to describe wheel spoke injuries and define the subtypes that these classifications did not cater for. As a result, the Lahore Classification, a new classification for wheel spoke injuries, is being proposed, along with management for each subtype.

Methodology: Retrospective study of a total 156 wheel spoke injuries of foot was undertaken to categorize/ classify these injuries in terms of injured structures. Wheel spoke injury patients of all ages and both genders; evaluated and admitted in Jinnah Burn & reconstructive surgery Centre (JB&RSC), Jinnah hospital/AIMC, Lahore, Pakistan were included in this study from January 2019 to December 2023.

Results: A total of 156 "Wheel Spoke Injury" patients involving feet presented to our department. Injury mechanism and structures involved were noted. There were 42 patients who did not fit in specific grades of the existing classifications. A modification in the existing classification for the wheel spoke injury was devised and management of different subtypes was undertaken. The proposed algorithm for management ranges from conservative care to the need for free flap to cover the defect.

Conclusion: Wheel spoke injuries of the foot can be managed more effectively with the help of a practical grading system. We propose a revised classification that will guide the management plan and a treatment algorithm which will ultimately improve the patient's outcome.

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Keywords | Wheel Spoke Injury; Lahore; Classification; Achilles Tendon; Calcaneal Fracture; Calcaneum; Tibial Nerve; Neurovascular Bundle; Flap coverage; Soft tissue; Skin graft; Sural Flap; Free flap; Foot; Heel; Ankle; Treatment Algorithm.

Introduction

Injuries requiring reconstruction are on the rise due to popularity of motor bikes as mode of transportation in Pakistan especially in crowded urban areas.[1] One of the injuries related to bike pillion riding is wheel spoke injury, which is caused by foot entrapment in the rotating spokes of bicycle or motorbike. Wheel spoke injuries sustained on motor bike are more severe due to higher momentum as compared to a bicycle.

In most cases foot is entrapped in rear wheel causing eversion and injury to weight bearing area (heel/ankle). While front wheel injury mainly causes inversion, with laceration over dorsum and medial aspect of the foot.[2] These injuries can vary from simple abrasion to a mangled

foot causing great morbidity to its victim. This injury also poses a great challenge to the health care provider. Long hospital stays and multiple surgeries is the fate of most of these injuries.

Since the first reported case of wheel spoke injury[3] many articles have been published about this injury. Authors have used various classifications to describe their findings. Some used Oestern and Tscherne soft tissue injury classification,[4-11] some modified soft tissue injury classification to better describe wheel spoke injury[12,13] and others used description of soft tissue injury with fractures classifications to classify the injuries.[14-17]

We routinely used classification for wheel spoke injury proposed by Yue-Liang Zhu et al[14], to grade severity of such injuries in our practice. But soon we realized the deficiency of this classification and the other classifications to completely describe the injury. The injury of Neurovascular bundle (NVB), which is not that infrequently seen in these patients and injury to foot other than heel/Ankle area is not included in most of the classifications.[12,14,15,16,17]

Since each wheel spoke injury is unique, we have devised a modified classification system that will help describe and evaluate these injuries better so that their effective management can be undertaken.

Methodology

We reviewed medical records of 156 wheel spoke injury patients which were referred to the Plastic Surgery unit by the A&E department of Jinnah hospital/AIMC, Lahore between January 2019 and December 2023.

In each case patient's history and primary assessment was undertaken. X-rays of the affected foot were taken. Final findings were noted per operatively.

Each patient was classified according to the known classifications.[12, 14, 15, 16, 17] Short comings in the currently used classifications were noted.Amodified classification was devised. Surgical management of each patient was undertaken according to the assigned grade.

The work was approved by the ethical committee of the specialized tertiary health care facility affiliated with Allama Iqbal Medical College.

Results

The total number of patients who presented with wheel spoke injury from January 2019 to December 2023 was 156. In 144 (92.31%) cases heel/ankle area was involved and in 12 (7.69%) cases other areas of foot were involved (Mostly Dorsum). (Figure 1).

Figure 1: *Anatomical location of injury*

Out of total 156 patients 111 (71.15%) were male and 45 (28.84%) were female. Right foot was involved in 96 (61.54%) and left foot was involved in 60 (38.46%) cases (Table 1).

Table 1: *Gender Distribution and Involved foot*

Total Patients	Sex		Foot	
	M	F	Rt	Lt
156	111	45	96	60
	71.15%	28.84%	61.54%	38.46%

Table 2: *Proposed Classification*

Lahore Wheel Spoke Injury Classification
Grade 0
• Abrasion or Laceration with or without Partial thickness skin loss • *No injury / exposure* of Achilles tendon or Bone or Neurovascular bundle
Grade 1
• Skin Defect with *Exposed* Achilles tendon Or Bone/Calcaneum
Grade 2
2A
• Skin defect with Achilles tendon *Rupture/Defect*
2B
• Skin defect with Achilles tendon *Rupture/ Defect* + Injury to *Neurovascular bundle*
Grade 3
3A
• Skin Defect with *Bone/Calcaneal Fracture* with or without Achilles tendon rupture/defect
3B
• Skin defect with *Bone/Calcaneum Fracture* with or without Achilles tendon Rupture + Injury to *Neurovascular bundle*
Grade 4
• Mangled Heel (Comminuted Fracture of Bone/Calcaneum + Achilles Tendon Rupture/Defect+ Injury to Neurovascular bundle+ Skin Defect)
Grade 5
· Injury of foot *other than Heel/Ankle area* with or without bony injury

At first, we graded our patients according to the classification proposed by Yue-Liang Zhu et al.[14] After catego-

rizing the patients, we were still left with 42 patients, who would not fit into any of the grades of the above-mentioned classification. The patients who did not fit in the classification were the ones with injury to the NVB, the patients with injury to foot other than heel/ankle area and the patients without significant soft tissue loss, but still needed special consideration as their grade might change after initial debridement.

Lahore Wheel Spoke Injury Classification is proposed so that it can describe and categorize the patients who did not fit in the above mentioned classification before. (Table 2).

According to the modified classification, total included patients i.e., 156 patients were graded as follows. 6 patients of Grade 0, 54 patients of Grade 1, 18 patients of Grade 2A, 12 Patients of Grade 2B, 39 patients of Grade 3A, 12 patients of Grade 3B, 3 patient of Grade 4 and 12 patients of grade 5.

Initial presentation of the wheel spoke injury can be misleading because some of the injuries that seem minor (Grade 0) on the first evaluation, their grades change after EUA and debridement. In our experience, there were 15 cases initially labeled as Grade 0, of which only 6 remained true Grade 0, the rest, i.e., 9 cases, changed to Grade 1 after debridement, and the total number of Grade 1 cases increased from 45 to 54.

In Figure 2, the number of cases and the percentages of various grades for 156 patients are displayed.

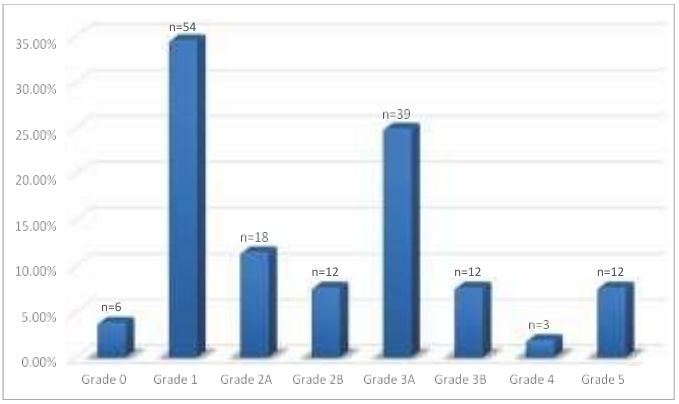

Figure 2: *Number of cases and percentage of assigned grades according to Lahore Wheel Spoke Injury Classification.*

Discussion:

Wheel spoke injury was first reported in 1948[3]. Many articles about the wheel spoke injury have been published since then. Some reported its incidence and others were to classify, treat and suggest prevention from the wheel spoke injury[4-18]. Its incidence was first reported in Pakistan by Dr Mushtaq Ahmed of Dow Medical College, Karachi, Pakistan . He reported 21 cases of wheel spoke from October 1976 to February 1978. He described the injuries, their mechanism, treatment and suggested measures to avoid the injury.

Due to the distinct mechanism of wheel spoke injury, the spectrum of its presentation is quite vast. Authors have used various classifications to describe the wheel spoke injury starting form Oestern and Tscherne classification of soft tissue injury[4,5,6,7,8,9,10,11] to the modifications of the Oestern and Tscherne classification[12,13].

Oestern and Tscherne classification of soft tissue injury[19,20] roughly covers all the aspects of injury but cannot describe the injury precisely. Its modifications[12,13] lack the description of minimal injury, injury to NVB or dorsum of foot which is seen every now and then in these patients.

We routinely used wheel spoke injury classification, proposed by Yue-Liang Zhu et al[14], to grade severity of such injuries in our practice. We reviewed our data from January 2019 to December 2023 and noted that 42 (26.92%) of 156 patients did not fit into any of the grades of the above-mentioned classification.

The patients who did not fit into this classification[14] were the ones with injury to the NVB i.e., 2B & 3B or patients with minimal injury i.e., True Grade 0 (6 of 15) who remained Grade 0 after EUA and debridement or the ones with injury to the dorsum of foot (Grade 5). In light of our findings, we modified the classification[14] in use to categorize the injuries that were not graded by it. (Figure 3).

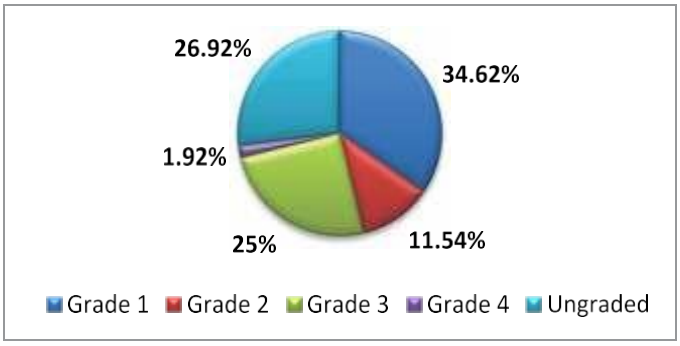

Figure 3: *Grades according to previously used classification*

It was concluded that all findings related to the wheel spoke injury cannot be summarized by any single existing classification, so Lahore Classification was devised.

The included 156 patients were then graded according to the Lahore Classification as follows. 6 patients of Grade 0, 54 patients of Grade 1, 18 patients of Grade 2A, 12 Patients of Grade 2B, 39 patients of Grade 3A, 12 patients of Grade 3B, 3 patient of Grade 4 and 12 patients of grade 5. The percentages of different grades in 156 patients were; Grade 0 (3.85%), Grade 1 (34.62%), Grade 2A (11.54%), Grade 2B (7.69%), Grade 3A (25%), Grade 3B (7.69%), Grade 4 (1.92%) and Grade 5 (7.69%). (Figure 4).

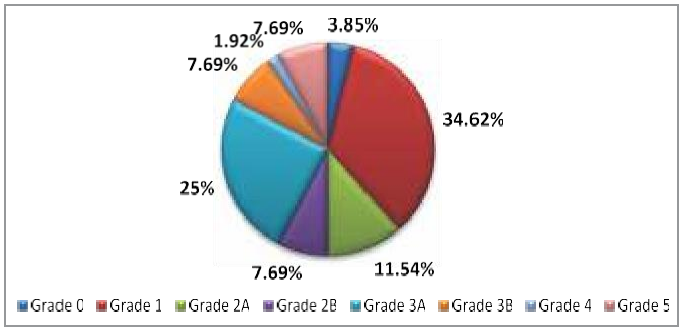

Figure 4: *Grades according to Lahore Classification*

It was also noted that most of the injured patients were males of age between 3-12 years and they mostly belonged to grades 1 and 3A.

The patients were initially assessed in the A&E department of the Jinnah Hospital/AIMC, Lahore, Pakistan. Following ATLS and primary care, the evaluation included patient's history, a comprehensive physical examination, and an examination of the injured leg or foot. The wounds were then washed and temporary dressing was applied. X-ray of the injured foot was taken to evaluate the bone status. The patients were then admitted in Jinnah Burn & Reconstructive surgery center, Jinnah Hospital, Lahore for management.

All patients underwent EUA and debridement. Findings were noted and injuries were graded. 9 of the original 15 Grade 0 injuries were converted to Grade 1 surgically because most of the times the underlying injury is much greater than the outer look of the wound. The bruised and lacerated skin/subcutaneous tissue does not always survive due to the crushing/cutting mechanism of the wheel spoke injury. Daily dressing along with intermittent VAC dressing was done where needed. Some cases required multiple debridements which were done according to the need. Once the grades were finalized, we discussed the cases and laid out plan for surgical treatment for each case according to its need. (Table 3)

Grade 0 injuries (Figure 5A-5C) whose grade did not increase after initial debridement were treated with dressings, delayed primary closure or split thickness skin graft (STSG) where needed.

Grade 1 injuries (Figure 6A-6E) with exposed tendon/bone were treated by skin grafting (on intact paratenon), coverage with artificial dermis + STSG (if wound bed was found suitable) and with local flaps accordingly.

Grade 2A injuries (Figure 7A-7D) which included lacerated/defected Achilles tendon and soft tissue loss were treated by repair/grafting of tendon with local flap coverage.

Grade 2B patients (Figure 8A-8D) were with injured NVB, lacerated/defected Achilles tendon and soft tissue loss. They were treated by repair/grafting of NVB, repair/grafting of tendon with flap coverage (mostly free).

Grade 3A patients (Figure 9A-9E) were with defected skin and bone/calcaneal fracture with or without Achilles tendon rupture/defect. They were treated by bony fixation (by orthopedic department), repair/grafting of the

Table 3: *Treatment Algorithm**

Wheel Spoke Injury							
Primary assesment according to ATLS protocol and provisional grading							
Examination Under Anethesia							
Grade 0	**Grade 1**	**Grade 2A**	**Grade 2B**	**Grade 3A**	**Grade 3B**	**Grade 4**	**Grade 5**
Dressings Or Delayed primary closure or Skin graft where needed.	STSG (on intact paratenon) or Coverage with artificial dermis + STSG (if wound bed was found suitable) or Coverage with local flaps.	Repair / Grafting of tendon + Local flap coverage	Repair / Grafting of NVB, + Repair / Grafting of tendon + Flap coverage (Local/Free)	Bony fixation + Repair / Grafting of the tendon + Flap coverage (Local/Free)	Bony fixation + Repair / Grafting of NVB + Repair / Grafting of tendon + Free flap coverage	Amputation	STSG/ Flap Coverage (Local/Free) + Bony Fixation where needed

** Bony fractures were treated (fixation or conservative management) by the Orthopedic department.*

tendon and coverage with local flaps.

Grade 3B (Figure 10A-10F) included patients with skin defect, fracture of bone/calcaneum, ruptured Achilles tendon and injured NVB. They were treated by bony fixation, repair/grafting of NVB, repair/grafting of tendon and coverage with flaps (Mostly free).

The fate of **Grade 4** (Figure 11A-11D) mangled feet was amputation.

Grade 5 Patients (Figure 12A-12C) were treated with STSG with or without artificial dermal matrix or flap coverage with bony fixation where needed.

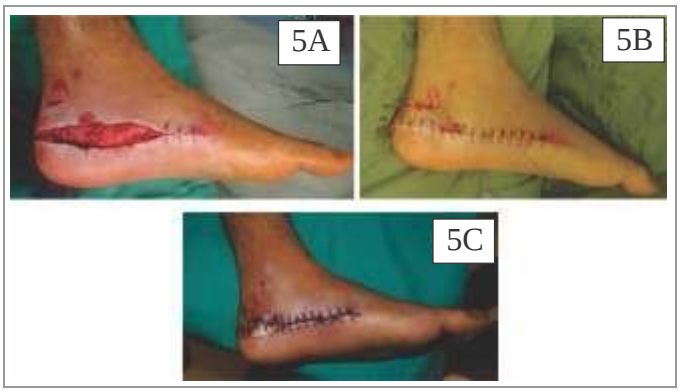

Figure 5: *26 years old male with **Grade 0** Injury of left foot **(A)**. After EUA it remained Grade 0 and was treated with delayed primary closure **(B)**. 3rd Post Op Day **(C)**.*

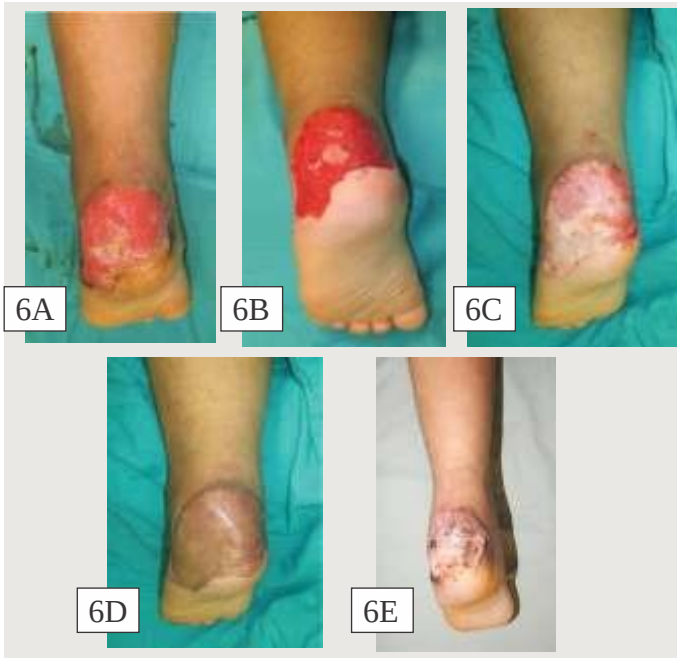

Figure 6: *10 years old male with **Grade 1** injury of left foot* **(A)**. *After debridement calcaneum was exposed **(B)**. He was treated with application of artificial dermis **(C)** and a thin split thickness skin graft **(D)**. 8th Post Op Day **(E)**.*

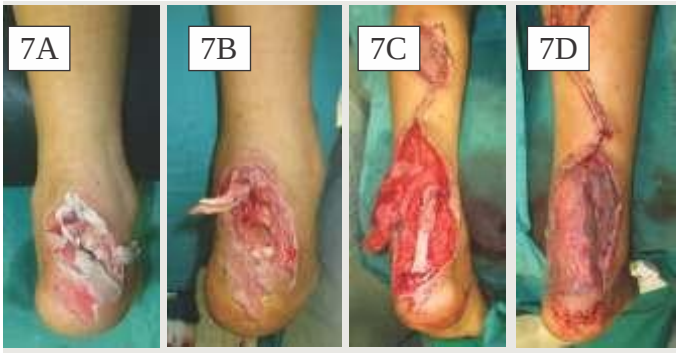

Figure 7: *12 years old male with **Grade 2A** injury to right foot with ruptured Achilles tendon* **(A, B)**. *He was treated with tendon repair with graft* **(C)** *and coverage of wound with Adipofascial Sural flap and STSG **(D)**.*

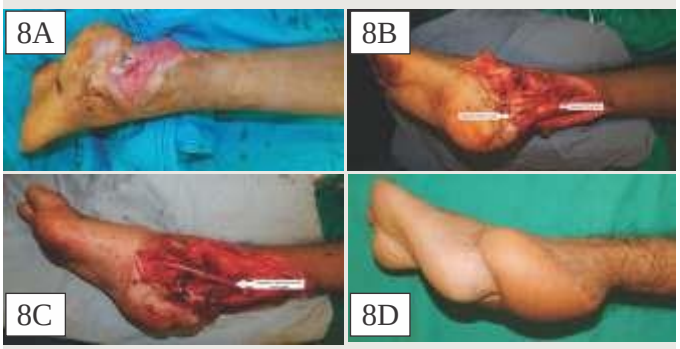

Figure 8: *17 years old male with **Grade 2B** injury with transected Tibial nerve and Achilles tendon (A). He was treated with Achilles tendon repair (B) and cable nerve graft for Tibial nerve (C). Wound coverage was done with free Scapular Parascapular flap (D).*

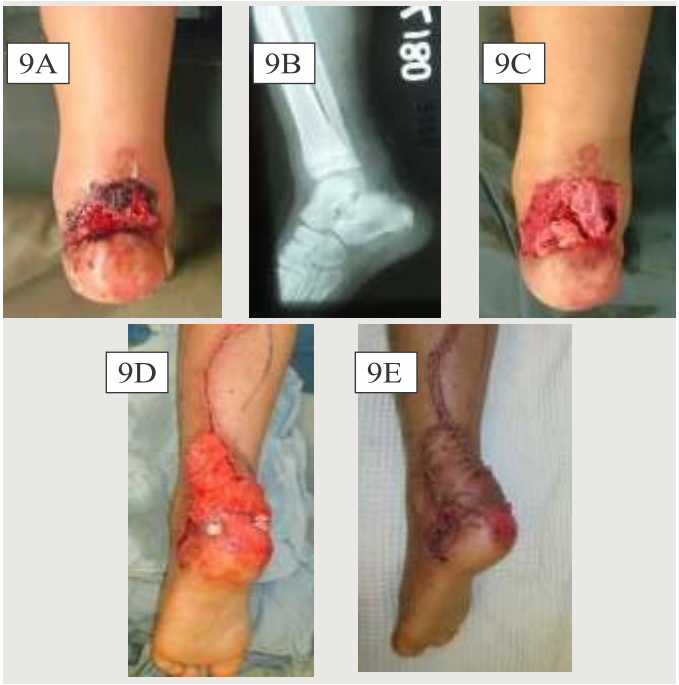

Figure 9: *6 years old female with **Grade 3A** injury to left foot (A) with chip fracture of Calcaneum (B) and a*

partial tear in Achilles tendon (C). Fracture was managed conservatively; Achilles tendon was repaired and wound was covered with Adipofascial sural flap (D) & STSG (E).

Figure 10: *7 years old male with **Grade 3B** injury of right foot (A). Fracture of Calcaneum, Talus and Tibia (B) was managed by the Orthopedic department. Achilles tendon (C) and Tibial nerve (D) were repaired with grafts. Wound was covered with free Scapular Parascpular flap (E). Two months Post Op (F).*

Figure 11: *24 years old male with **Grade 4** injury of left foot (1 A-D). Amputation was done by the Orthopedic department*

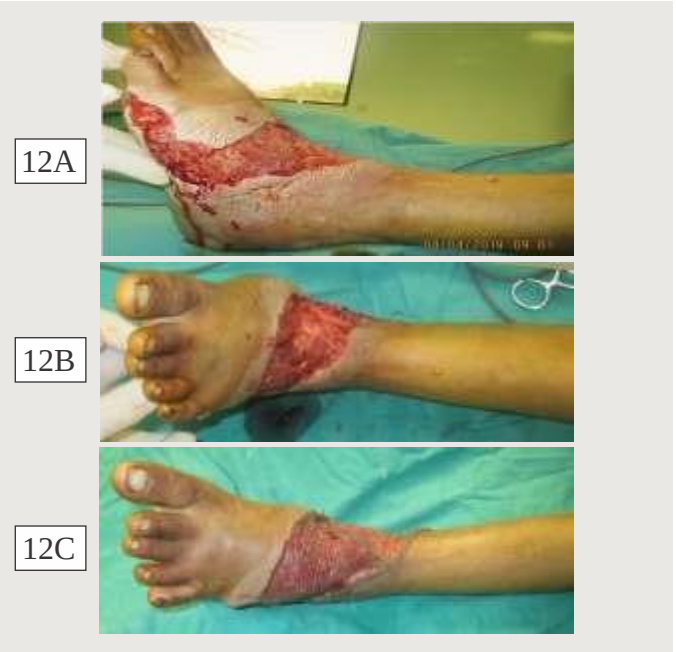

Figure 12: *10 years old male with **Grade 5** Injury to left foot (A). After debridement (B) wound was covered with STSG (C).*

Conclusion

Wheel spoke injury is a distinct entity amongst lower limb trauma and is peculiar to pillion riding. As weight bearing area; heel/ankle is most commonly involved, it causes great morbidity for the patient in terms of long hospital stay and multiple surgeries. It also poses great challenge for the reconstructive surgeon.

With motorcycle getting popular by the day as an easy affordable mode of transportation[1], the incidence of wheel spoke injury is inevitable in low to middle income countries like Pakistan. A well devised grading system to define such injuries could help manage the injuries better.

The Lahore Wheel Spoke Injury Classification is the result of a study that spanned over half a decade and included a large number of representative cases. Almost all aspects of wheel spoke injuries, including their proposed management, are covered by it.

The limitations of the study were that it was a single hospital study, which may not represent the whole population.

Multi-centered studies are recommended for the future. In addition, safety awareness campaigns and legislative measures should be established to prevent these injuries from occurring.

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Author's Contribution:

The following authors have made significant contributions to the manuscript as under:

Dr Usman Ishaque: Author, Data collection, and Research

Dr Ata Ul Haq: Acquisition, analysis and interpretation of data

Dr Ahsan Riaz: Analysis and Technical Editing

DrUsman Khalid: Data collection and article writing

Dr Muhammad Younas Mehrose: Technical editing and Study supervision

Dr Ahmed Tarek Emam: Scientific advisor and data analysis.

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Research Article

Quality of Life after Pharyngeal Flap Surgery in Cleft Palate Patients with Velopharyngeal Insufficiency

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Abstract

Background: Velopharyngeal Insufficiency (VPI) leads to hyper-nasal speech in children, often associated with cleft palate. Surgical corrections such as pharyngeal flap surgery aim to enhance speech and quality of life (QoL). The VPI effect on life outcome (VELO) questionnaire evaluates VPI's impact on QoL.

Objective: This study examines post-surgery QoL changes, VELO validation, and the association between VELO results and speech intelligibility to better understand VPI surgery outcomes.

Methodology: This prospective cross-sectional study was conducted at Fauji Foundation Hospital Rawalpindi from July 2022 to January 2024. Using the VELO instrument, we assessed children and young adults undergoing pharyngeal flap surgery for VPI. The outcomes focused on comparing pre and postoperative VELO scores and perceptual speech measurement, alongside correlating VELO scores with speech intelligibility.

Results: Fifteen patients (6 males, 9 females) with an average age of 12.2 (±3.8) years underwent pharyngeal flap surgery for VPI. There was a significant decrease in preoperative speech intelligibility postoperatively ($P < .000$). Post-surgery VELO scores showed improvement, with caregiver impact remaining unchanged. A strong correlation was observed between speech intelligibility and VELO scores, emphasizing the surgery's positive influence on VPI patients' speech.

Conclusion: The pharyngeal flap surgery notably improves the specific QOL for VPI.

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Keywords | Velopharyngeal insufficiency, VELO, pharyngeal flap

Introduction

Velopharyngeal insufficiency (VPI), part of velopharyngeal dysfunction (VPD), is marked by inadequate soft palate closure against the pharyngeal wall in speech, causing hyper-nasal speech. VPI often results from neuromuscular dysfunction or structural anomalies in the velum, predominantly seen in children with cleft palates.[1] Despite surgical efforts, a significant percentage of cleft palate children continue to experience VPI, underlining the need for continuous care and research for enhanced outcomes. Addressing cleft-related speech issues is vital for children's independence and societal integration, as these children face higher risks of social, behavioral, and academic challenges, along with increased depression symptoms and the likelihood of being teased.[2]

Optimal management for children with orofacial clefts, including VPI, requires a holistic and multidisciplinary approach.[3] Surgical interventions, primarily the pharyngeal flap, are crucial in improving VPI.[4] Quality of Life (QOL) studies have gained prominence in orofacial cleft research. This investigation elucidates the influence of pharyngeal flap surgery on Quality of Life (QoL) in pediatric and young adults afflicted with Velopharyngeal

Insufficiency (VPI).[5] Furthermore, it introduces the VELO questionnaire as a measurement instrument for quantifying the ramifications of VPI on QoL. This research highlights the imperative necessity for additional studies aimed at delineating the nexus between subjective experiences and objective clinical outcomes post-VPI surgery.

Methodology

Conducted as a prospective cross-sectional study, this research was undertaken in the Department of Plastic Surgery at Fauji Foundation Hospital, Rawalpindi, with the consent of the Institutional Review Board. The respondents encompassed all patients admitted from July 2022 through Jan 2024 diagnosed with residual Velopharyngeal Insufficiency subsequent to cleft palate repair. Eligible participants were those aged six years or older, having previously undergone primary cleft palate repair and diagnosed with VPI. Exclusion criteria encompassed patients with a velopharyngeal gap larger than 2 cm in anteroposterior diameter, hearing impairment, craniofacial syndromes, existing palatal fistulas, obstructive sleep apnea syndrome, or severe intellectual disabilities. Patient privacy and data protection were ensured by anonymizing patient identities and omitting medical registration numbers and names throughout the study. Consent was obtained from the parents of minors and directly from patients aged 18 or older.

Demographic data such as age, gender, cleft type, and standardized pre- and postoperative speech assessments were recorded. All patients underwent superiorly based pharyngeal flap surgery (Figure 1) to address the velopharyngeal gap, performed by an experienced plastic surgeon specializing in this procedure for over five years.

The VELO instrument, tailored for VPI-related quality of life assessment, comprises a 26-item questionnaire for parents and a 23-item version for youth. This tool was translated into Urdu through a detailed process involving both forward and backward translation by a fluent Urdu speaker. The parent version was provided to all parents, while patients older than eight received the youth version. Responses were collected using a 5-point Likert scale, ranging from 'never' (0) to 'almost always' (4). The VELO is categorized into five subgroups: speech limitation, swallowing problems, situational challenges, emotional impact, and perception by others. It also includes an additional three questions for parents to gauge caregiver impact. Surveys were administered pre-operatively and at the 3-month post-operative speech evaluation.

Standard preoperative perceptual speech assessments were conducted by a speech pathologist and documented before surgery. Speech intelligibility, a primary measure for VPI-specific quality of life, was graded on a validated scale ranging from 0 (within acceptable limits) to 3 (severe), assessing nasal air emission and resonance severity. These assessments were performed at baseline and again three months following surgery. All data were meticulouslyrecordedinawell-structuredquestionnaire.

Figure 1. *a- Pre-operative b- Pharyngeal Flap raised c- Inserting of the Pharyngeal Flap d- Post-Operative*

For statistical analysis, frequencies and percentages were calculated for patient characteristics and other categorical variables, while medians were determined for continuous data. We compared preoperative and postoperative total VELO scores with age, baseline speech intelligibility, and cleft type. The correlation between total VELO scores and speech intelligibility and pre and post-operative VELO scores in parents and children were also analyzed using the Paired sample T-test. The correlation between VELO total scores and age was evaluated using Pearson's correlation coefficient. A P-value of less than 0.05 was deemed statistically significant.

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS version 23.0, Inc., Chicago, IL). Tables and figures were generated using Microsoft Excel 2016.

Results

A total of 15 patients with Velopharyngeal Insufficiency (VPI) were enrolled in the study after meeting all inclusion criteria and completing the VELO instrument before surgery. Table 1 presents demographic details for all patients. All patients underwent a pharyngeal flap. The mean (SD) age was 12.2 (3.8) years, ranging from 6 to 17 years. There were 6 (40%) males and 9 (60%) females. More than half of the patients had a history of unilateral cleft lip and palate (n=9, 60%).

Complete pre-surgery and post-surgery perceptual speech datasets were available for all patients. The mean (SD) baseline speech intelligibility rating (0-3 scale) was 2.8, which decreased to 1.2 (P<.000). Approximately 80% of patients showed an improvement in intelligibility from severe to mild postoperatively. Nasal air emission decreased to mild in about 86.7%, while nasal resonance decreased in 73.3% of the patients postoperatively. These results indicate a significant improvement in speech intelligibility, nasal air emission, and nasal resonance (p= 0.000, p=0.001, p=0.009, respectively).

Table 1: *Demographic details of the patients*

Demographics	Patients n (%)
Age	
Mean (SD)	12.2 (3.8)
Gender	
Male	6 (40)
Female	9 (60)
Diagnosis	
Isolated cleft palate	5 (33.3)
Unilateral cleft lip and Palate	9 (60)
Bilateral cleft lip and palate	0 (0)
Submucosal cleft palate	1 (6.7)

VELO scores were categorized into two groups: VELO scores provided by parents and VELO scores provided by patients over the age of 8. Two patients below the age of 8 did not receive the VELO child version of the questionnaire. The mean pre-operative parent VELO score and child VELO scores were 47.6 and 43.6 (SD =10.1 and 6.6), respectively. Both scores significantly improved postoperatively by a mean of 32.8 and 27.7, respectively (p= 0.000). All subscale domains improved except caregiver impact, which showed no change after surgery, with a mean change of only 0.8 in pre-operative and post-operative scores (Table 2). Both preoperative and postoperative total scores were significantly correlated with speech intelligibility. Figure 2 displays boxplots of preoperative and postoperative VELO scores by preoperative and postoperative speech intelligibility, respectively.

Table 2: *VELO scores pre-surgery and post-surgery*

VELO Total Scores	Pre-operative	Post Operative	Change in VELO	p-value
VELO- parent	47.6 (10.1)	14.8 (4.1)	32.8 (6)	**0.000**
Velo - Caregiver (subscale)	8.4 (2.2)	7.6 (1.8)	0.8 (0.4)	0.068
VELO- Child	43.6(6.6)	15.9 (3.9)	27.7 (2.7)	**0.000**

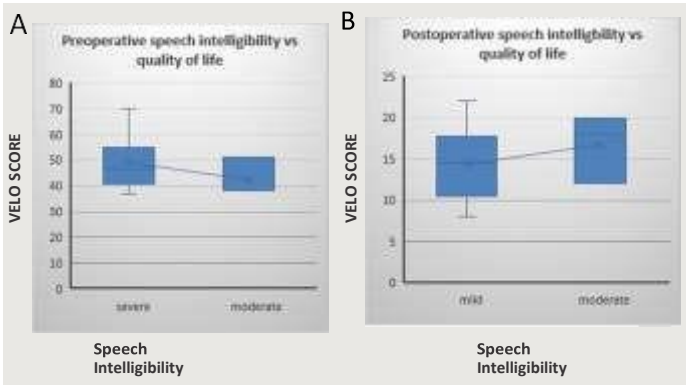

Figure 2. *Association of preoperative (A) and postoperative (B) speech intelligibility with quality of life*

Discussion

Enhancing Quality of Life (QoL) has become essential to medicine.[6] Disease-specific instruments have been designed to assess clinically pertinent changes in various patient groups. This allows clinicians to recognize important concerns that patients suffering from a specific disease might have.[7] In this study, we successfully measured the impact of VPI on our patients' Quality of life. Although the etiology of VPI can be diverse, it's worth noting that cleft palate is the most frequently encountered cause. Despite surgical correction, 20% of patients can have VPI secondary to palatal stiffness and scarring.[8] Cleft Palate is a prevalent condition impacting many newborns in Pakistan. The incidence of cleft lip and/ or palate was identified to be one per 523 births in the northern area of Pakistan.[9] A recent survey reported 55.2% of cases with cleft lip and palate and 14.6% cases of isolated cleft palate.[10] In our research, 60% (n=9) of the individuals with VPI enrolled had a unilateral cleft lip and palate, and 33.3% (n=5) were diagnosed with isolated cleft palate.

VPI can negatively impact the quality of Life. Lu et. Al's use of VELO on patients with VPI in West China revealed a median score of 72 (range of 0-100, with 0 representing the worst QoL and 100, the best).[11] Due

to different interpretations of the same instrument, it's difficult to compare this result with our study results. Barr et. Al discovered a notable decrease in perceived quality of life as tested through VELO among both parents and children with VPI when compared with a healthy cohort.[12]

In our study, patients demonstrated significant improvement after undergoing speech surgery. This finding is consistent with other studies so far. Bhuskute et. Al and Skirko et. Al found an improved VELO score overall and significant improvements in all subscale domains of the instrument except Caregiver Impact and Perception by Others, respectively.[13,14] Our study results align well with those of Bhuskute and co-authors as we detected significant improvements in all subscale domains, with the exception of the Caregiver Impact. Blacam et. Al reported a mean VELO score of 74.5 in patients who had undergone pharyngeal flap pharyngoplasty.[(15)] While the investigators did not include pre-operative scores for comparison, the post-operative VELO outcome is close to the mean score of 77.7 reported by Bhuskute et. Al.[13]

Bhuskute et. Al additionally tested speech outcomes through a speech-language pathologist and found the mean speech intelligibility rating (scale 0 to 3) to be 1.71, significantly decreasing to 0.79 post-operatively. Only two patients remained in the severe category.[13] As per our analysis, speech intelligibility significantly improved from a mean of 2.8 to 1.2. They also found preoperative and postoperative VELO scores to be significantly associated with the speech intelligibility rating. Our study yielded identical findings. Blacam et. Al found a slow but significant improvement in articulation following pharyngeal flap pharyngoplasty.[(15)] Baek et. Al also reported significant improvement in speech intelligibility.[16] Nasal resonance decreased significantly post-operatively in 73.3% of our patients. Blacam et. Al reported a comparable outcome, with 79.3% of patients showing substantial improvement in hypernasality. Nasal Air Emission decreased to mild in 86.7% of our patients, whereas Blacam et. Al observed only a 50% improvement in their patients.[15]

This is the first study to be conducted in our region, which probably has a significant VPI burden, to address quality of life concerns. This study also validates the use of Urdu translation of VELO, as we observed a statistically substantial correlation between VELO scores and Speech Intelligibility rating. This paves the way for future studies and allows us to expand on the current study. Clinical observation and studies have revealed that after surgery, it can take 6 to 18 months for significant improvement, allowing patients to adjust to their new anatomy through speech therapy.[(17,18)] Our study found significant improvements in almost all domains at the 3-month post-operative follow-up, which leads us to believe continued follow-up with VELO should result in a further enhancement of quality of life. Our study adds to the limited current literature existing on this topic so far.

Our limitations include a small sample size despite a long study interval. Our results might not be representative of a broader population. The study only included children with specific structural causes of VPI, excluding syndromic patients. We recommend further studies with a larger sample size, including other causes of VPI, to address the disease burden in our region.

Conclusion

We conclude that quality of life significantly improves after pharyngeal flap surgery in patients with VPI. VELO provides patient-specific outcomes for a broader understanding of the social, emotional, and physical effects of VPI.

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Author's Contribution

The following authors have made significant contributions to the manuscript as under:

Hira Feroz Akbar: Conceptualization, Writing-Original Draft, Formal Analysis, Methodlogy

Ayesha Aslam: Supervision, Conceptualization, Writing - Review and Editing, Methology

Maheen Ahmed: analysis and interpretation of the data and actual write-up of manuscript

Sameena Aman: Data collection, interpretations or results and final approval

Nousheen Saleem: Writing -Review and Editing

Mehwish Mehmood: Substantial contributions to the acquisition, analysis and interpretation of data

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Case Report

An Unusual Case of Penile Strangulation by a Metal Ring in an Adult Patient: Presentation and Management

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Abstract

Penile rings are devices used to sustain an erection by restricting the outflow of blood from the cavernosal tissue. However, prolonged use can lead to complications such as penile ring entrapment. We report a rare clinical case of penile strangulation by a metal ring in a 27-year-old male, who initially presented to a local clinic. Despite the removal of the ring using a bone cutter, he developed pain and skin necrosis requiring extensive management in a collaborative multidisciplinary approach, involving plastic surgery, urology, and emergency medicine departments. This case underscores the need for timely intervention and a multidisciplinary approach to address the challenges and complications arising from penile strangulation.

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Keywords | Penile strangulation, Penile Ring, Penile gangrene, Split thickness skin graft, Case report.

Introduction

Penile strangulation is a rare serious urological emergency that can lead to severe complications.[1] Constrictive devices used intentionally to enhance sexual performance or due to psychiatric conditions leads to prolonged erections and penoscrotal engorgement due to constriction of venous outflow, progressively obstructing arterial inflow, resulting in ischemia and subsequent necrosis of penile tissue.[2] The extent of injury can vary from mild skin abrasion to severe complications such as urethral damage, gangrene, and even penile amputation.[3] Despite the severity, patient embarrassment often leads to delayed presentation, complicating treatment outcomes.[3,4] This case aims to highlight these critical aspects through the presentation of a unique incident.

Case Presentation

We report the case of a 27-year-old male who presented with a history of penile strangulation following the application of an adjustable metallic ring. The patient, seeking to enhance sexual performance, had placed his phallus through the ring. After two days of unsuccessful attempts to remove the ring due to increasing pain and swelling, the patient, embarrassed and fearing social stigma, sought medical help at a local clinic [figure 1a]. Initial attempts at removal involved sliding after lubrication, pulling, and cutting maneuvers, all of which were unsuccessful. Ultimately, a urology resident bisected the ring using a bone cutter after multiple attempts in the emergency department. The patient chose not to seek further medical attention and returned home.

Five days post-removal, the patient presented to the Plastic Surgery Department at Capital Hospital, CDA, Islamabad, with persistent pain and evident penile discoloration. His pain was graded at 6/10 on the pain scale. Physical examination revealed a circumcised penis with a circumferential necrotic patch at the base measuring 4×3 cm on the dorsal aspect and 3×3 cm on the ventral aspect [figure 1b]. The penis also exhibited distal edema, but there were no signs of urethral discharge, and the external meatus appeared normal. No systemic

abnormalities were noted, and abdominal examination did not reveal any palpable bladder (sign of urinary retention).

The patient's blood work was within normal limits, and he was deemed fit for anesthesia. Surgical intervention commenced six days post-ring removal under spinal anesthesia. The procedure included excision of the constriction ring at the base of the penis and debridement of necrotic tissues on both the dorsal and ventral surfaces [figure 1c]. The viability of the underlying tissue was confirmed intra-operatively, with no bleeding observed from the urethra and normal coloration of the glans penis. The defect at the base of the penis was primarily closed using interrupted 5/0 prolene sutures [figure 1d and 1e]. A 14 Fr Foley's catheter was inserted, and the area was dressed with bactigrass to support healing. Postoperatively, the patient received intravenous antibiotics and analgesics.

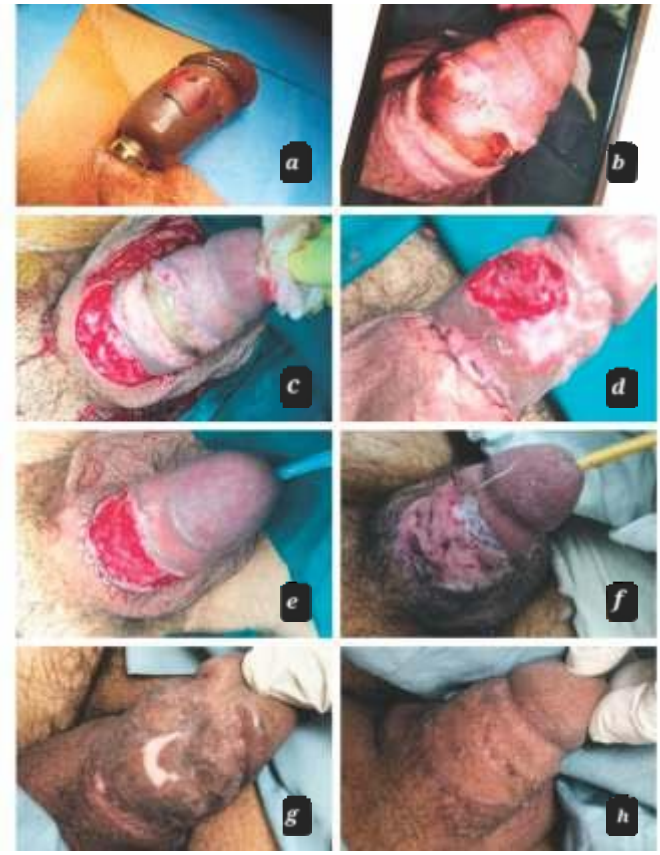

Figure 1: *Images at different stages of the treatment process until complete recovery- produced with consent from the patient*

On the 5th postoperative day, the patient underwent further surgery to address the necrotic areas which were healing well. Under spinal anesthesia and aseptic conditions, a split-thickness skin graft was harvested from the patient's right thigh using a humby knife. The graft was manually meshed and placed on both the dorsal and ventral aspects of the penis, secured with 5/0 Prolene sutures. Post-graft care included Bactigrass and sterile gauze dressing, with daily assessments. The patient was discharged on the 3rd day post-second surgery, with follow-up scheduled in the outpatient clinic [figure 1f]. One month later, the patient reported no urinary or erectile dysfunction and expressed satisfaction with the cosmetic and functional outcomes of the surgery [figure 1g and h].

Discussion

This case illustrates the critical challenges and complexities inherent in managing penile strangulation. The delay in seeking medical assistance due to social stigma, as observed in our patient, highlights the urgent need for greater public awareness regarding the severity of this condition. Prompt medical intervention is crucial to prevent the progression of complications and to preserve both the cosmetic and functional integrity of the penis. In initial management, non-invasive methods such as lubrication and manual manipulation are preferred.[4] However, when these approaches fail, more invasive techniques such as cutting the constricting device become necessary.[2] In this case, the application of a bone cutter was essential. It is imperative during such procedures to meticulously avoid thermal and mechanical injuries to the penile tissue, which could worsen the condition.

Following the initial emergency response, a thorough surgical evaluation of tissue viability is critical.[5] Our approach involved the excision of necrotic tissue and careful assessment of the remaining penile shaft, which facilitated confident progression to reconstructive measures. In severe cases, such as this one where necrosis had set in, debridement followed by reconstruction via skin grafting is necessary to ensure functional restoration. The success of this intervention underscores the importance of a collaborative multidisciplinary approach, involving plastic surgery, urology, and emergency medicine. This cooperation is vital in providing comprehensive care that addresses all aspects of the patient's condition.

The literature review reveals a notable lack of standardized protocols for the management of penile strangulation, though existing classifications by Bhat et al. and Sawant et al. offer a framework based on injury severity that assists in treatment planning.[4,6] These classification systems highlight the importance of detailed clinical

examinations and tailor management strategies according to the severity of the injury. Furthermore, given the embarrassment associated with penile strangulation cases, there is a significant need for educational initiatives aimed at reducing stigma and promoting earlier medical intervention.[5] Patients should also be counseled on the potential risks associated with the use of penile constrictive devices and the importance of seeking immediate medical help should complications arise.

Conclusion

Penile strangulation is a medical emergency demanding immediate and effective intervention through a coordinated multidisciplinary approach involving plastic surgery, urology, and emergency medicine to manage and resolve the complications associated with penile entrapment.

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Editorial

Protecting Patient confidentiality in the Era of Social Media

Prof. M. Mustehsan Bashir, Dr. Saadia Nosheen Jan

Introduction

We live in an era where securing cases for elective procedures in the private sector is largely dependent on social media advertising. This involves posting success stories with pre and post-operative images of patients. Discretionary steps are often limited to blackout of the eye areas, which is often insufficient to hide the patient's identity. Moreover, doctors who have had the opportunity to operate on celebrities proudly exhibit their pictures on laptops to potential patients and even in classroom lectures for that extra marketing oomph. Photographic consent forms are unheard of in our country and patients are largely unaware how their data is being used and shared.

In the West, confidentiality is part of patient care, as data breaches can impact the holistic well-being an vulnerability of the patient. Cybercriminals infiltrating into plastic surgery records usually use them to mutilate the data or for intimidation and extortion. Data protection failure makes the organisation liable to face legal action and compensation.

Storing data in a safe place that is physically disconnected to non-confidential hospital records or creating backups that cannot be edited or altered are some of the solutions being examined to prevent a data violation in developed countries. Other processes including routers, switches and Firewalls are also being scrutinized to examine the data before deciding the appropriate location to store the type of data and block outbound packages containing sensitive information or from computers not permitted to access the hospital internal systems.

Web proxy servers to communicate through private emails of patients are being suggested. Hacked accounts are usually traced back to a security error by the surgeon himself. All surgeons must be aware that data privacy is a core responsibility and part of a core competency of every surgeon and that legal implications are imminent in case of a data leak.

Data protection is a responsibility yet to be recognized and implemented in our country. Plastic surgery is one field where confidentiality is especially important.

No systems exist to protect patient confidentiality, which is an inherent right of the patient. Patient confidentiality in plastic surgery should be part of the plastic surgery curriculum. Serious consequences including loss of trust in the doctor-patient relationship and mental trauma can arise just by a slip of the tongue or revealing an image the patient has not consented to. Photographic consent forms that clearly state how patient data shall be used should be integrated into pre-operative consent forms including for research purposes and unnecessary disclosure without patient consent for personal gains should be discouraged among plastic surgeons.

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INSTRUCTIONS TO THE AUTHORS AND REVIEWERS OF THE MANUSCRIPTS

(Base upon Minimum Requirements for Writing and Editing of Manuscripts)

Introduction

The new Editorial Board of Pakistan Journal of Plastic Surgery during its meeting held on January, 2019 decided to follow the "Uniform requirements for manuscripts submitted to Biomedical Journals: writing & Editing for Biomedical Publications by International Committee of Medical Journal Editors. A brief account of minimum requirements is given below for assisting the authors, reviewers and editors, the full text can be read, (www.icmje.org). Moreover plagiarism policy of ICMJE, Higher Education Commission and PMDC will be observed. It is authors' responsibility to apprise them of plagiarism in any form including paraphrasing and self plagiarism. The Plagiarism Standing Committee of Pakistan Journal of Plastic surgery would deal with cases of plagiarism and comprise of staff members, and editors. Those claiming intellectual/ idea or data theft of an article must provide documentary proof in their claim otherwise their case will be sent for disciplinary action.

General Principles

1. Title Page

The title page should carry the following information:

1. The title of the article. Concise titles are easier to read than long, convoluted ones. Authors should include all information in the title that will make electronic retrieval of the article both sensitive and specific.
2. Authors' names and Title of the Program. The names and other relevant information should be on title page only to ensure blind peer review of research article.
3. The name of the department(s) and institution(s) to which the work should be attributed.
4. Disclaimers, if any.
5. Corresponding authors. The name, mailing address, telephone and fax numbers, and e-mail address of the author responsible for correspondence about the manuscript.
6. Source(s) of support in the form of grants, equipment, drugs, or all of these.
7. Word counts. A word count for the text only (excluding abstract, acknowledgments, figure legends, and references). A separate word count for the Abstract is also useful for the same reason.
8. The number of figures and tables.
9. Conflict of Interest Notification Page

2. Conflict of Interest Notification Page

To prevent the information on potential conflict of interest for authors from being overlooked or misplaced, it is necessary for that information to be part of the manuscript. It should therefore also be included on a separate page or pages immediately following the title page.

3. Abstract and Key Words

An abstract (requirements for length and structured format vary by journal) should follow the title page. The abstract should provide the context or background for the study and should state the study's purposes, basic procedures (selection of study subjects or laboratory animals, observational and analytical methods), main findings (giving specific effect sizes and their statistical significance, if possible), and principal conclusions. It should emphasize new and important aspects of the study or observations.

Authors are requested to provide, and identify as such, 3 to 10 key words or short phrases that capture the main topics of the article. These will assist indexers in cross-indexing the article and may be published with the abstract. Terms from the Medical Subject Headings (MeSH) list of Index Medicus should be used.

4. Introduction

Provide a context or background for the study (i.e., the nature of the problem and its significance). State the specific purpose or research objective of, or hypothesis tested by, the study or observation; the research objective is often more sharply focused when stated as a question. Both the main and secondary objectives should be made clear, and any pre-specified subgroup analyses should be described. Give only strictly pertinent references and do not include data or conclusions from the work being reported.

5. Material and Methods

The Methods section should include only information that was available at the time the plan or protocol for the study was written; all information obtained during the conduct of the study belongs in the Results section.

(a) Selection and Description of Participants

Describe your selection of the observational or

experimental participants (patients or laboratory animals, including controls) clearly, including eligibility and exclusion criteria and a description of the source population. The guiding principle should be clarity about how and why a study was done in a particular way. When authors use variables such as race or ethnicity, they should define how they measured the variables and justify their relevance.

(b) Technical Information

Identify the methods, apparatus (give the manufacturer's name and address in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods (see below); provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods, give reasons for using them, and evaluate their limitations. Identify precisely all drugs and chemicals used, includ-ing generic name(s), dose(s), and route(s) of administration. Also describe diagnostic or therapeutic procedures if part of the study design.

(c) Statistics

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Define statistical terms, abbreviations, and most symbols. Specify the computer soft-ware used.

6. Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations.

When data are summarized in the Results section, give numeric results not only as derivatives (for example, percentages) but also as the absolute numbers from which the derivatives were calculated, and specify the statistical methods used to analyze them. Restrict tables and figures to those needed to explain the argument of the paper and to assess its support. Use graphs as an alternative to tables with many entries; do not duplicate data in graphs and tables.

7. Discussion

Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. For experimental studies it is useful to begin the discussion by summarizing briefly the main findings, then explore possible mechanisms or explanations for these find-ings, compare and contrast the results with other relevant studies, state the limitations of the study, and explore the implications of the findings for future research and for clinical practice.

Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not adequately supported by the data. Avoid claiming priority and alluding to work that has not been completed. State new hypotheses when warranted.

8. References

(a) General Considerations Related to References

Although references to review articles can be an efficient way of guiding readers to a body of literature, review articles do not always reflect original work accurately. Small numbers of references to key original papers will often serve.

Avoid using abstracts as references. References to papers accepted but not yet published should be designated as “in press” authors should obtain written permission to cite such papers as well as verification that they have been accepted for publication. Informa-tion from manuscripts submitted but not accepted should be cited in the text as “unpublished observations” with written permission from the source.

Avoid citing a “personal communication” unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, authors should obtain written permission and confirmation of accuracy f rom t he source of a personal communication.

For articles published in journals indexed in MEDLINE, the Pakistan Journal of Plastic Surgery considers PubMed (http://www.pubmed.gov) the authoritative source for information about retractions.

(b) Reference Style and Format

The Uniform Requirements style is based largely on an ANSI standard style adapted by the National Library of Medicine (NLM) for its databases. For samples of reference citation formats, authors should consult National Library of Medicine web site.

References should be numbered consecutively in the order in which they are first mentioned in the text. Identify references in text, tables, and legends by Arabic numerals in parentheses. The titles of journals should be abbreviated according to the style used in Index Medicus. Consult the list of Journals Indexed for MEDLINE, published annually as a separate publication by the National Library of Medicine.

9. Tables

Tables capture information concisely, and display it efficiently; they also provide information at any desired level of detail and precision. Including data in tables rather than text frequently makes it possible to reduce the length of the text.

Type or print each table with double spacing on a separate sheet of paper. Number tables consecutively in the order of their first citation in the text and supply a brief title for each. Do not use internal horizontal or vertical lines. Give each column a short or abbreviated heading. Authors should place explanatory matter in footnotes, not in the heading. Be sure that each table is cited in the text.

10. Illustrations (Figures)

Figures should be either professionally drawn and photo-graphed, or submitted as photographic quality digital prints. In addition to requiring a version of the figures suitable for printing, Pakistan Journal of Plastic Surgery ask authors for electronic files of figures in a format (e.g., JPEG or GIF) that will produce high quality images in the web version of the journal; authors should review the images.

For x-ray films, scans, and other diagnostic images, as well as pictures of pathology specimens or photomicrographs, send sharp, glossy, black-and-white or color photo-graphic prints, usually 127 x 173 mm (5 x 7 inches). Letters, numbers, and symbols on Figures should therefore be clear and even throughout, and of sufficient size that when reduced for publication each item will still be legible. Figures should be made as self-explanatory as possible, since many will be used directly in slide presentations. Titles and de-tailed explanations belong in the legends, however, not on the illustrations themselves.

Photomicrographs should have internal scale markers. Symbols, arrows, or letters used in photomicrographs should contrast with the background.

If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph. When-ever possible permission for publication should be obtained.

Figures should be numbered consecutively according to the order in which they have been first cited in the text.

11. Legends for Illustrations (Figures)

Type or print out legends for illustrations using double spacing, starting on a separate page, with Arabic numerals cor-responding to the illustrations. When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend.

12. Units of Measurement

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Temperatures should be in degrees Celsius. Blood pressures should be in millimeters of mercury, unless other units are specifically required.

13. Abbreviations and Symbols

Use only standard abbreviations; the use of non-standard abbreviations can be extremely confusing to readers. Avoid abbreviations in the title. The full term for which

14. Drug Name

Generic names should be used. When proprietary brands are used in research, include the brand name and the name of the manufacturer in parentheses after first mentioning of the generic name in the Methods section.

15. Guidelines for Authors and Reviewers

All material submitted for publication should be sent exclusively to the Pakistan Journal of Plastic Surgery. Work that has already been reported in a published paper or is described in a paper sent or accepted elsewhere for publication, should not be submitted. Multiple or duplicate submission of the same work to other journal should be avoided as this fall into the category of publication fraud and are liable for disciplinary consequences, including reporting to Pakistan Medical & Dental Council and Higher Education Commission. A complete report following publication of a preliminary report, usually in the form of an abstract, or a paper that has been presented at a scientific meeting, if not published in full in a proceedings or similar publication, may be submitted. Press reports of meetings will not be considered as breach of this rule, but additional data or copies of tables and illustrations should not amplify such reports. In case of doubt, a copy of the published material should be included with a

manuscript for editors' consideration.

Authors can submit their articles by post or by E-mail: pjpspakistan@gmail.com to the Editor, Pakistan Journal of Plastic Surgery. Article can also be submitted by post or by hand on a Compact Disc (CD) with three hard copies. Articles submitted by E-mail are preferred mode of submission and do not require any hard copy.

All authors and co-authors must provide their contact telephone/cell numbers and E-mail addresses only on the title page of manuscript.

A duly filled-in author's certification proforma is mandatory for publication. The duly signed ACP must be returned to the Pakistan Journal of Plastic Surgery office as soon as possible. The sequence / order of the authors on ACP once submitted shall not be changed at any stage.

It is mandatory to provide the institutional ethical review board / committee approval for all research articles, at the time of submission of article.

The editors reserve the right to edit the accepted article to conform to the house-style of the Journal.

16. General archival and linguistic instructions

Authors should submit the manuscript typed in MS Word. Manuscripts should be written in English in British or American style/format (same style should be followed throughout the whole text), in past tense and third person form of address. Sentences should not start with a number or figure. Any illustrations or photographs should also be sent in duplicate. Components of manuscript should be in the following sequence: a title page (containing names of authors, their postal and Email addresses, fax and phone numbers, including mobile phone number of the corresponding author), abstract, key words, text, references, tables (each table, complete with title and footnotes) and legends for llustrations and photographs. Each component should begin on a new page. The manuscript should be typed in double spacing as a single column on A4 (8-1/2" x 11" or 21.5 cm x 28.0 cm), white bond paper with one inch (2.5 cm) margin on one side.

Sub-headings should not be used in any section of the script except in the abstract. In survey and other studies, comments in verbatim should not be stated from a participating group. Acknowledgements are only printed for financing of a study or for acknowledging a previous linked work.

From January 2016, all randomized trials should also provide a proof of being registered at the **International RCT Registry.**

17. Material for Publication

The material submitted for publication may be in the form of an Original research (Randomized controlled trial - RCT, Meta-analysis of RCT, Quasi experimental study, Case Control study, Cohort study, Observational Study with statistical support etc), a Review Article, Commentary, a Case Report, Recent Advances, New techniques, Debates, Adverse Drug Reports, Current Practices, Clinical Practice Article, Short Article, KAP (Knowledge, Attitudes, Practices) study, An Audit Report, Evidence Based Report, Short Communication or a Letter to the Editor. Ideas and Innovations can be reported as changes made by the authors to an existing technique or development of a new technique or instrument. A mere description of a technique without any practical experience or innovation will be considered as an update and not an original article. Any study ending three years prior to date of submission is judged by Editorial Board for its suitability as many changes take place over the period of time, subject to area of the study. Studies more than three years old are not entertained. In exceptional cases, if Editorial Board is of the view that data is important, an extension of one year may be granted. Pakistan Journal of PlasticS urgery also does not accept multiple studies/multiple end publications gathered/derived from a single research project or data (wholly or in part) known as 'salami slices'.

Original articles should normally report original research of relevance to clinical medicine. The original paper should be of about 2000-2500 words excluding abstract and references. It should contain a structured abstract of about 250 words. Three to 10 keywords should be given for an original article as per MeSH (Medical Subject Headings). There should be no more than three tables or illustrations. The data should be supported with 20 to 25 references, which should include local as well as international references. Most of the references should be from last five years from the date of submission.

Clinical Practice Article is a category under which all simple observational case series are entertained. The length of such article should be around 1500 - 1600 words with 15 - 20 references. The rest of the format should be that of an original article. KAP studies, Audit reports, Current Practices, Survey reports and Short Articles are also written on the format of Clinical Practice Article. Evidence based reports must have at least 10 cases and word count of 1000 - 1200 words with 10 - 12 references and not more than

2 tables or illustrations. It should contain a non-structured abstract of about 150 words. Short communications should be of about 1000 - 1200 words, having a non-structured abstract of about 150 words with two tables or illustrations and not more than 10 references. Clinical case reports must be of academic and educational value and provide relevance of the disease being reported as unusual. Brief or negative research findings may appear in this section. The word count of case report should be 800 words with a minimum of 3 key words. It should have a non-structured abstract of about 100 - 150 words (case specific) with maximum of 5 - 6 references. Not more than 2 figures shall be accepted.

Review article should consist of critical overview/analysis of some relatively narrow topic providing background and the recent development with the reference of original literature. It should incorporate author's original work on the same subject. The length of the review article should be of 2500 to 3000 words with minimum of 40 and maximum of 60 references. It should have non-structured abstract of 150 words with minimum 3 key words. An author can write a review article only if he/she has written a minimum of three original research articles and some case reports on the same topic.

Letters should normally not exceed 400 words, with not more than 5 references and be signed by all the authors-maximum 3 are allowed. Preference is given to those that take up points made in contributions published recently in the journal. Letters may be published with a response from the author of the article being discussed. Discussions beyond the initial letter and response will not be entertained for publication. Letters to the editor may be sent for peer review if they report a scientific data. Editorials are written upon invitation.

Between 3 to 10 key words should be given for all the category of manuscripts under the abstracts as per mesh [medical subject heading].

18. Thesis Based Article

Thesis based article should be re-written in accordance with the journal's instructions to the author guidelines.

Article shall undergo routine editorial processing including external review based upon which final decision shall be made for publication. Such articles, if approved, shall be published under the disclosure by author that 'it is a Thesis based article'.

19. Ethical Considerations

If tables, illustrations or photographs, which have already been published, are included, a letter of permission for re-publication should be obtained from author (s) as well as the editor of the journal where it was previously published. Written permission to reproduce photographs of patients, whose identity is not disguised, should be sent with the manuscript; otherwise the eyes will be blackened out. If a medicine is used, generic name should be used. The commercial name may, however, be mentioned only within brackets, only if necessary. In case of medicine or device or any material indicated in text, a declaration by author/s should be submitted that no monetary benefit has been taken from manufacturer/importer of that product by any author. In case of experimental interventions, permission from ethical committee of the hospital should be taken beforehand. Any other conflict of interest must be disclosed. All interventional studies submitted for publication should carry Institutional Ethical & Research Committee approval letter.

Ethical consideration regarding the intervention, added cost of test, and particularly the management of control in case-control comparisons of trials should be addressed: multi-centric authors' affiliation may be asked to be authenticated by provision of permission letters from ethical boards or the heads of involved institutes.

20. Authorship Criteria

As stated in the Uniform Requirements, credit for authorship requires substantial contributions to (a) the conception and design or analysis and interpretation of the data, (b) the drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search and actual write up of manuscript, (c) final approval of the version to be published. Each author must sign a statement attesting that he or she fulfills the authorship criteria of the Uniform Requirements.

The Journal discourages submission of more than one article dealing with related aspects of the same study. The journal also discourages the submission of case reports unless unreported from Pakistan. Unusual but already reported cases should, therefore, be submitted as letters to the editor.

21. Copyright

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22. Proofs

Page proofs will be emailed, without the original manuscript, to the corresponding author for proof correction and should be returned to the editor within three days. Major alterations from the text cannot be accepted. Any alterations should be marked, preferable in red.