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Research Article

Experience of Primary Cleft Lip And Palate At A Tertiary Care Hospital in Pakistan: A 4 Year Retrospective Review

Usama Ahmed Rana,[1] Hussan Birkhez Shami,[2] Saadia Nosheen Jan,[3] Muhammad Sohail,[4] Hamid Hussain Ansari,[5] Farid Ahmed Khan[6]

[1-5]Department of Plastic, Reconstructive Surgery and Burn Unit, Mayo Hospital, KEMU, Lahore
[6] Services Institute of Medical Sciences Lahore

Abstract

Objectives: To retrospectively review our experience of primary cleft lip and palate surgery at a tertiary care hospital

Methods: This was a retrospective study, reviewing the records of all patients with cleft lip and palate operated in, from September 2012 to October 2016.Data analysis was done using SPSS (16.0).

Results: During this period, a total of 316 patients were seen (149 males and 167 females). 60 had isolated cleft palate, 83 had isolated cleft lip and 173 had combined cleft lip and palate. Patient age was meansd(15 days-33 years). A total of 349 procedures were performed out of which, 205 were primary repairs (118 primary lip repairs and 87 primary palate repairs).

Conclusion: Majority of the patients of cleft lip and palate presented at later ages; efforts should be made for an earlier repair.

Key Words | Cleft lip, cleft palate, primary repair.

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Corresponding Author|Hussan Birkhez Shami, Senior Registrar, Department of Plastic Surgery, Reconstructive Surgery and Burn Unit, Mayo Hospital, KEMU, Lahore.

Email: hussanbirkhezshami@gmail.com

Introduction

Cleft deformities pose both functional and aesthetic challenges to the patient. Although cleft lip deformity poses obvious aesthetic problems, cleft palate is linked with the more functional dilemma of speech and hearing. The goals of cleft palate surgery are to improve speech; whereas that of cleft lip repair, are to improve the aesthetic looks.[1,2,3]

Literature is evident that cleft lip and palate is the commonest presentation, whereas left sided clefts are twice as frequent as the right side. Also, female gender is associated more with the isolated palate.[4,5] However, little information is available regarding the patterns of presentation of clefts in Pakistan. Another problem of developing countries is the late presentation of patients delaying the management and thus hampering the quality of life of the affected person.[6] Again, there is lack of data regarding the age of presentation of clefts in our country.

Our department treats large volumes and all varieties of cleft and of all ages. Here we share our experience of this grave problem at a large tertiary care hospital in a developing country presenting the patterns of cleft, age of presentation and corrective techniques used at our center.

Methodology

The record of all patients with cleft lip and palate seen in from September 2012 to October 2016 were reviewed retrospectively. All the cases were included. Patients having incomplete data entry in files were excluded. Data collection included demographics (patient's age at presentation, gender, socioeconomic background). We also looked at the type of cleft, side of cleft. The surgical procedures done were also noted

and that if they were primary or secondary.

Data entry was done in SPSS version 16. Data was analyzed to identify the patterns of cleft. Ratios of different types of clefts and sidedness in unilateral clefts were calculated. Which cleft was more common in each gender was also identified. Further, age at presentation was also looked into to see if patients were presenting early or late.

Results:

Data of all patients were included as none of the files were found to be incomplete. During this period, a total of 316 patients were operated on ((149 males and 167 females) and a total of 349 procedures were done. 60 had isolated cleft palate (ICP), 83 had isolated cleft lip (ICL) and 173 had combined cleft lip and palate (CLP)(Table 1).

We found the ratio of isolated cleft palate (ICP) to isolated cleft lip (ICL) to cleft lip and palate (CLP) to be 2:3:6. The ratio of left to right side clefts was 2:1. In case of isolated cleft palate (ICP) male to female ratio was almost 1:2. In case of isolated cleft lip (ICL) and cleft lip and palate (CLP) male to female ratios were similar.

Age at presentation ranged from 15 days to 33 years.

Table 1: *Types of Cleft (In Detail)*

Cleft type	Sidedness	Male	Female	Total
Isolated cleft palate		18	42	60
Isolated cleft lip	Bilateral	6	3	9
Isolated cleft lip	Right	15	11	26
Isolated cleft lip	Left	23	25	48
Cleft lip and palate	Bilateral	30	19	49
Cleft lip and palate	Right	24	20	44
Cleft lip and palate	Left	33	47	80
Total		149	167	316

Most of the patients presented at later ages (Table 2).

A total of 349 procedures were performed, out of which 205 were primary repairs (118 primary lip repairs and 87 primary palate repairs). The most frequently used technique for lip repair was Millard or its modified form (Table 3). The most frequently deployed technique for palate repair was Two flap palatoplasty followed by Langenback (Table 4).

Almost all patients belonged to low income class backgrounds.

Discussion

It is evident from our study that combined cleft lip and palate (CLP) is more common than isolated cleft lip (ICL) or palate (ICP). Overall Left to right side cleft lip ratio (with or without palate) is 2:1. However, left sided is more common in females and right sided in males. Such a pattern has been reported in other studies as well.[4,5,7]

Table 2: *Age at Presentation*

	Age at presentation			
Primary Cheiloplasty	Before 3 months	4 – 6 months	After 6 months	Total
	10	51	57	118
Primary Palatoplasty	Before 1 year	1 – 2 years	After 2 years	
	15	28	44	87

Table 3: *Techniques Used in Primary Lip Repair*

	Technique	No of Repairs
Cheiloplasty	Millard Type Variant	90
	Straight Line	14
	Fisher	11
	Mulliken	3
	Total	118

Table 4: *Techniques Used in Primary Palate Repair*

	Technique	No of repairs
Palatoplasty	Two Flap Palatoplasty and Variants	37
	Langenback Variant	34
	Furlow's Procedure (Double Opposing Z-plasty)	7
	Pushback Variant	6
	IVVP	3
	Total	87

In developing countries, a patient with craniofacial deformities inevitably present very late. The most notable reasons are a lack of finances, unawareness of the availability or need for repair, remoteness of available services, and fear of surgery.[6,8] Our study also showed that the majority of patients presented at later ages than recommended. However, we did not document the reasons for late presentation but postulate them to be similar to what is stated in literature.

According to our guidelines, cleft lip should be repaired by 3 months of age and cleft palate, by 9

months of age. For lip repair we use the rule of 10 i.e., at least 10 week age, 10 pound weight and 10g/dL haemoglobin.[9] It is our experience that usually by 3 months of age the baby would have achieved this criterion. We have also seen that by 9 months of age, the baby's breathing has improved and the airway patency has also improved so palatoplasty can be done. These factors are counterbalanced by the need for normal speech at the appropriate age.

If there is combined cleft lip and palate, a 2 staged repair is warranted. Concomitant repairs potentially compromises airway and can lead to excessive blood loss.

However some studies suggest that simultaneous repairs should be done to reduce the chances of drop out especially in developing countries like Nigeria. There is sufficient evidence to suggest that the outcome is not worse if both cheiloplasty and palatoplasty are done as a single staged procedure.[6,10,11,12]

Cleft lip is a social stigma because it is more apparent and evident from birth; though it does not have major functional adverse effects. However, cleft palate is more of a function related problem which poses difficulties later in life; predominantly velopharyngeal insufficiency that causes speech, hearing problems and upper respiratory tract infections. That's why cleft lip should be repaired early to increase social acceptance.[1]

Early palate repair has positive effects on speech. Studies have suggested that late repairs have adverse effects on speech.[13,14]

We recommend efforts to increase public awareness of the problem and how to get it addressed; it can comprise of TV advertisement, surgical expeditions to the far flung areas and holding seminars there, educating the rural doctors to play their role by reporting new cases or educating the patients about possibility of repair. Regarding the financial constraints, patients should be made aware of free of charge services that the public hospitals in Pakistan provide. Moreover, Doctors should counsel patients regarding their fear of surgery.

Lastly, our study is not without its limitations. Ours is a single center experience. Patterns of the presenting age might be different for other cleft centers or groups practicing cleft surgery by doing regular surgical camps. They may be seeing patients early after birth. Also, reasons of late presentation was not part of the initial file work. We recommend large multicenter studies to see the patterns. Moreover, the patterns of patients treated at the cleft camps should be compared to those treated at hospitals. Further, reasons of late presentation should be identified and documented in the initial data entry so that they can be addressed in future.

Conclusion

Patterns of cleft lip and palate seen at our institute are quite similar to what is reported in literature. More patients present late at our center which is similar to what is found by researchers from other developing countries as well. Multicenter studies should be carried out to see the patterns of cleft at the provincial, national level and efforts should be made to treat these patients early by identifying and dealing with reasons of late presentation.

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Research Article

Percutaneous Needle Aponeurotomy: A Viable Option for Management of Dupuytren's Contracture

Samia Fatima,[1] Roomana Akhlaque,[2] YawarSajjad,[3] Nabila Naz[4]

[1,2,4]Lahore General Hospital, Plastic Surgery Department, Lahore, Pakistan, [3]Jinnah Hospital, Lahore

Abstract

Background: Dupuytren's contracture (DC) is a progressive disease characterized by thickening of connective tissue of the palmar fascia and formation of cords which progressively thicken and shorten resulting in flexion contractures of joints. Over the last few decades, there is paradigm shift towards minimally invasive procedures for this problem. Percutaneous needle aponeurotomy has the benefits of being minimally invasive, providing rapid healing and recovery time, and early return to work. Furthermore, there is reduced need for formal occupational therapy.

Methods: This is a prospective cohort study of all patients who were managed with Percutaneous Needle Aponeurotomy(PNA) for Dupuytren's contracture at the plastic and reconstructive surgery department of Lahore General Hospital from September 2017-August 2019.PNA was performed in the operating room, under local anesthesia without using sedation.

Result: A total of 17 hands were treated with percutaneous aponeurotomy.The degree of total residual extension deficit was the primary outcome of the procedure. Average follow-up period was 10 months. After the follow-up period, recurrence was detected in 5 patients (29.4%). There was an improvement from baseline of 80 percent(40-45 degrees) at the 10-months follow-up.

Conclusion: PNA technique provides significant advantages in the choice of surgical treatment options for DC as it is less invasive than other methods, feasible under local anesthesia, has low complication rates with shorter hospital stay, allows rapid return to work, and has low cost.

Keywords | Dupuytren's contracture, Percutaneous Needle Aponeurotomy

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Corresponding Author | Roomana Akhlaque,

E-mail: roomanaakhlaque@gmail.com

Introduction

Dupuytren's contracture (DC) is a progressive disease in which there is thickening of connective tissue of the palmar fascia resulting in formation of cords which thicken and shorten, leading to flexion contractures of joints. The metacarpophalangeal (MCP) joint and the proximal interphalangeal (PIP) joint are most often affected. The contractures of these joints eventually lead to the hand deformity impairing the individual's ability to perform routine tasks with the affected hand resulting in compromised quality of life for the affected individual.[1]

In the literature, a variety of treatment modalities have been described for the treatment of symptomatic contractures. Conservative treatment options include physical therapy and rehabilitation, radiotherapy, steroid injection, 5-fluorouracil injection, and oral tamoxifen use.[2] Surgical treatment methods include percutaneous needle aponeurotomy (PNA), open fasciotomy, partial fasciectomy (PF), radical fasciectomy, and dermofasciectomy.[3] For the last few decades, there has been a paradigm shift towards minimally invasive procedures. The collagenase injection has emerged as a popular non-operative

treatment option for Dupuytren's contrac-ture.[4] Although the injectable collagenase has shown promising results forcorrection of MCP joint contractures,but recent studies have shown that injectable collagenase. Percutaneous needle aponeurotomy for DC has many benefit. It is a minimally invasive technique, with rapid healing and recovery time allowing early return to work. There is alsoreduced need for formal occu-pational therapy. In this study, we aimed to present the early outcomes of patients with DC treated with Percutaneous Needle Aponeurotomy technique.

Methods

This is a prospective cohort study of all patients who were operated via Percutaneous needle aponeurotomy for Dupuytren's contracture at the Plastic and reconstructive surgery department of Lahore General Hospital from September 2017-August 2019. Patient characteristics which were documented included age, sex, comorbidities, unilateral/bilateral disease, recurrence and family history. Preoperative data about the digits involved and the degree of contracture at each joint was recorded. We excluded the patients with isolated metacarpophalangeal joint contractures and patients with other concomitant hand condition.

PNA was performed under local anesthesia in the operating room. No sedation was used. In one patient, general anesthesia was given. The extremities to be treated were prepared with antiseptic solution. The fingers to be treated were marked with a surgical pen. Prior to aponeurotomy, the distal sensation in the pulp of each digit was assessed to ensure that digital nerve function remained intact. We used a 26G needle as a scalpel for aponeurotomy.

Following the palpation of the cord and the nodules, the needle was inserted in a perpendicular position to the cord. The fingers were flexed and extended to ensure that the needle did not contact the flexor tendons. During the procedure, patients were warned to report any paresthesia in the fingers to avoid nerve damage. Fingertip sensitivity was repeatedly checked through the procedure. The release was started proximally and progressed distally.

The needle was inserted through the dermis at a tangent and a plane between the dermis and cord was developed along the whole width of the palpable cord. In cases where the overlying skin was a bit mobile over the cord, the needle was reoriented vertically, the needle tip bevel was used to repeatedly sweep or graze the surface of the cord. While the fingers were kept in the extension posture, we performed multiple punctures with the needle perpendicular to the cord on the different portals that were spaced 5 mm apart while the fingers were kept in extension posture. However, in severe cases where the overlying skin was tightly adherent to the cord, we inserted the needle at one edge of the cord and used horizontal to and fro motion while keeping continuous extension force at the joint. We changed the needles at frequent intervals to maintain the sharpness of the needle. Following the procedure, the fingers were forced to undergo hyperextension so that the remaining weakened fibrous strands of the cord were broken.

After completing the aponeurotomy procedure, light bandage with cotton and gauze wrap with volar slab was given to the hands and allowed removal of the bandage after forty eight hours. The patients were discharged on the same day without any restriction regarding hand or finger movements. Polyclinic examinations were performed at the second, sixth weeks, third, sixth months, and first year postoperatively. Hematoma, ecchymosis, edema, infection, skin lacerations were reported as minor early complications. Vascular, nerve or tendon injury, and pulley ruptures were reported as major early complications. Prolonged edema, chronic nerve damage, joint stiffness, flexion limitation, additional finger deformity, and reflex sympathetic dystrophy (RSD) were reported as late complications.

Result

The primary outcome was the degree of total residual extension deficit.It was assessed by a finger goniometer at metacarpophalangeal and Interphalangeal joints.A total of 17 hands were treated with percutaneous aponeurotomy. Majority of digits involved had grade 1(<45 degree) or grade 2(45 to 90 degree) contracture. Majority of digits had contractures of both MP and Proximal Interphalangeal joints. In one patient, there was a large nodule in the palm in addition to the cords which was also excised from the palm. Average follow up of residual extension deficit was of 10 months. After the follow-up period, recurrence was detected in 5 patients (29.4%). The average dura-tion of recurrence was 14 months. Minor complications rate was 23% (n=4), however there was no major complication. A superficial infection developed in one patient that recovered by

short-term oral antibiotic use.

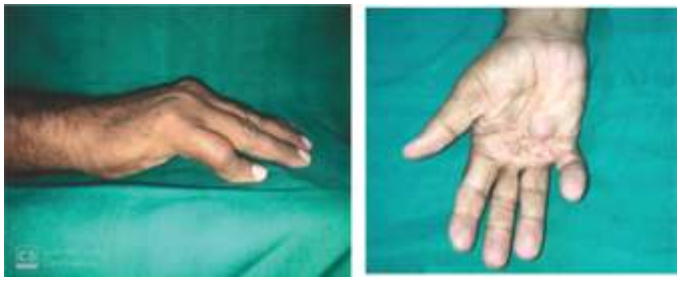

Figure: 1 (a&b) *Pre Operative Views of a Patient with Dupuytren's Contracture with Palmer Nodule*

Two patients underwent skin tears during PNA application and were treated with simple primary suture. In none of the patients, skin graft was needed for closure of the wounds. None of our patients had vascular or tendon injury, pulley rupture, prolonged edema, finger loss/amputation, additional finger deformity or RSD. In 3 out of 5 patients who developed recurrence, at least one grade regression was seen as compared to the grade before surgery. There was an improvement from baseline of 80 percent(40-45 degrees) at average follow up.

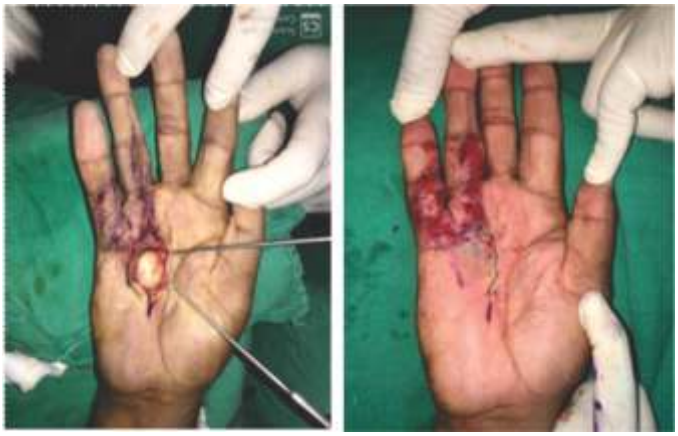

Figure 2(a&b): *Per Operative Picture Showing Excision of Nodule and b: Immediate Post Operative View*

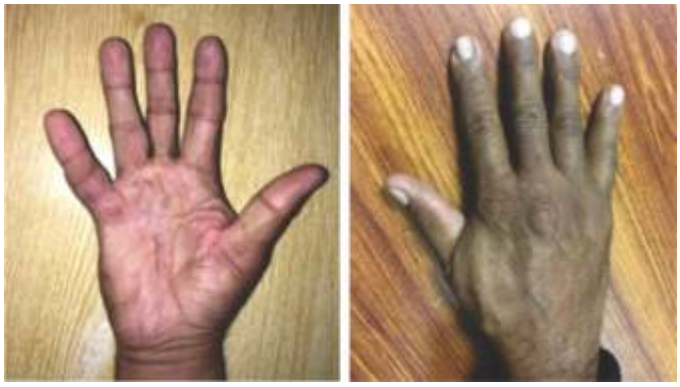

Figure 3 (a&b): *6 Month's Post Operatively, Patient has full Extension.*

Discussion

The surgery for thedupuytren contracture cannot cure the disease ra4ther it is offered to the patient to improve the hand function and quality of life. Therefore, the author feels that opting radical surgery for a disease which has a significant recurrence rate should be judiciously decided. The minimally invasive surgery provides high satisfaction to the patients with impro-ved function and increased range of motion, even without achieving full extension.[1] Reported recu-rrence rates vary from 0 to 73% for PF,[6,7] 50 to 85% for PNF,[6,8] and 8 to 47% for dermofasciectomy.[9] The reasons these figures vary so much are the lack of standard definitions for recurrence and the varying follow-up periods.

In recent years, the percutaneous needle aponeurotomy has emerged asthe primary mode of surgical treatment of DC. The results of DC cases treated with PNA technique are variable. In a study conducted by Badoiset al.[10] in 1993, 90 patients treated with PNA were reported to have 50% recurrence while 20% developed early minor complication after five years of follow-up. There was no major complication in this study. Foucheret al.[11] indicated that they achieved a recurrence rate of 58% after 3.2 years of follow-up in their PNA series.

In 2006, Van Rijssen and Werker[8] reported a recurrence rate of 65% in the follow-up of 52 patients (74 fingers) treated with PNA. Moreover, in 2012, Pesset al.3 stated a recurrence rate of 48%in 474 treated patients (1,013 fingers) and followedup by a mean follow-up duration of three years. Furthermore, Herrera et al5 reported a recurrence rate of 12% in the early results of 193 hands and 525 fingers treated with PNA with an average follow-up duration of 4.5 months in 2015. Cools and Verstreken12reported the results of 33 patients treated by combining PF with the open palm technique after a mean follow-up of2.5 years and demonstrated 33.5% recurrence and 21% complication rates. Dias and Braybrooke13 showed a recurrence rate of 15% after a mean follow-up of 27 months in a large series of 1,871 fingers, while the postoperative complication rate was quite high at 46%.

In a randomized controlled study comparing the outcomes of PNA and limited fasciectomy after five years, Van Rijssen[6] reported a very high five-year recurrence rate of 85%. However, patients who recurred still preferred PNA over fasciectomy for repeat

treatment.

Dupuytren's contracture is a common disease that may be diagnosed by simple clinical physical examination. Besides, it has an important place in the practice of hand surgery. PNA technique provides significant advantages in the choice of surgical treatment options for DC as it is less invasive than other methods, feasible under local anesthesia, has low complication rates with shorter hospital stay, allows rapid return to work, and has low cost.

Although the PNA has high rates of recurrence relative to open fasciectomy procedures. But the insinuation of recurrence following PNA may be different than that following open release as the majority of patients with recurrence after PNA can be treated safely and effectively with a repeat PNA procedure.[14,8]

Conclusion

Percutaneous needle aponeurotomy is an effective method for the treatment of primary Dupuytren's disease. Additionally, PNA allows both hands to be treated on consecutive days and is safe in high-risk patients.

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Research Article

Tendon Repair and Outcome Audit

Ahmad Faraz Bhatti,[1] Aatif Mehmood,[2] Denial Jordan,[3] David Haughton,[4] Fahmy S Fahmy[5]

Department of Plastic and Hand Surgery, Countess of Chester Hospital, Chester, UK

Abstract

Introduction: Tendon repair is one of the commonest procedures performed in the hand surgery. This repair is associated with two major complications of tendon rupture and tendon adhesions. We have reviewed the results of our technique of tendon repair and compared the results with international standards.

Methods: This is a retrospective review of prospectively maintained data at department of Plastic Surgery at Countess of Chester Hospital UK, from 1st June 2010 to 1st June 2011. All patients who underwent tendon repairs were included. We devised a proforma to standardize the information collection. Parameters studied included mode of trauma, zone of injury, average number of tendons involved, and rate of complication of tendon rupture and stiffness.

Results: A total of 108 procedures were done for tendon injuries, of which 56% were flexor tendons and 44% were extensor tendons. Glass injuries account for the majority of cases, both for flexors and extensors. Average number of tendons involved per injury was 2 for flexors and 1.5 for extensors. The most commonly used technique of repair was 2-strand modified Kessler with continuous epitendinous suture. We observed a 5% rate of rupture and 6.5% of stiffness for flexor tendons and 4% of rupture and 2% of stiffness rate of extensor tendons.

Conclusion: 2 strands modified Kessler repair with 4/0 Proline in small size tendons and 3/0 Proline in large size tendons with 6/0 Proline over and over continuous epitendinous suture is a good technique for tendon repair.

Keywords | tendon injury, modified Kessler repair, tendon rupture

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Corresponding Author | Ahmad Faraz Bhatti

Email: afbhatti1@yahoo.co.uk

Introduction

Different surgeons have always shown a variety of techniques for tendon repair to achieve problem free healing. Rupture, adhesion and reoperation arecommon problems encountered after tendon repairs.[1-2] Refinements of current techniques are always sought to improve the results. Although most commonly employed technique in flexor tendon repair is modified Kessler repair, there are a number of other techniques popularized by different people throughout the world. We have evaluated our unit's one-year record of tendon repair and compared it with the results of different other techniques. The preferred technique of the senior author for flexor tendon repair is 2 strand modified Kessler repair with 4/0 Proline in small sized tendons and 3/0 Proline in large size tendons and 6/0 Proline continuous over and over running epitendinous repair. We set this technique as standard for us. All cases received standard physiotherapy of early active mobilization. We aim to assess the results of this standard technique with respect to rupture rates and stiffness, and compare this with the standard rates.[2]

Methods

We did a retrospective review of prospectively maintained data of all patients undergoing extensor or flexor tendon repair at our unit in a 12-month period from 1st June 2010 to 31st May 2011.We devised a proforma to standardise the collection of information from the operative and hand therapy notes on the charts of each patient treated during this time. All relevant demographic information was recorded. The parameters studied included method of injury, average delay from injury to presentation, zone of injury and pulley involvement. Rate of complications of rupture and stiffness were assessed at follow-up visits

Results

Over 1 year, a total of 108 tendon repairs were performed. Of these 56% were flexor tendons and 44% were extensors tendons. Mean age at presentation was 34.5 years (flexor) and 36.7 years (extensors). Average delay from injury was 1.7 days and 1.8 days for flexors and extensors respectively (Table 1).

Common mechanisms of injury are depicted in table 2. Glass injuries are the most common cause of both flexor and extensor tendon injuries.

The average number of tendons injured and digits involved per injury is shown in table 3. For flexor tendons, Zone 2 injuries were most common. In the case of extensors, all zones seem to be equally involved (Table 4). Per-operative findings relating to the injury (amount of tendon injured and involvement of pulley) are shown in table 5.

The most commonly used technique was 2 strands modified Kessler core stitch using 3/0 or 4/0 Prolene (Table 6 & 7) and continuous over and over epitendinous suture with 6/0 Prolene.

Majority of the patients complied with post-operative splint usage and physiotherapy. The details of post-operative follow-up are depicted in table 8.

There was a 5% of rupture rate and 6.5% of stiffness for flexor tendons and 4% of rupture and 2% of stiffness rate of extensor tendons (Table 9).

Discussion

If one asked a patient what he or she considers an excellent result after repair of a flexor tendon, the answer would be return to normal. We are happy to call the result ”excellent” when they are 85% normal. Using modern suturing and rehabilitation, we mostly

Table 1: *Tendons Involved, Mean Age and Mean Delay since Presentation*

	Flexor Tendon	Extensor tendon
No. of patients	61	47
Mean age (years)	34.5	36.7
Average delay since injury (days)	1.7	1.8

Table 2: *Method of Injury*

Method	Flexor Injuries	Extensor injuries
Glass	23	18
Metal	24	11
Saw	7	12
Ceramic	1	1
Punch	0	1
Drill	0	1
Crush	2	0
Axe	1	0
Not detailed	3	3

Table 3: *Number of Tendons and Digits Injured*

	Flexor Tendons	Flexor Digits	Extensor tendon	Extensor Digits
Min	1	1	1	1
Max	10	4	6	4
Ave	2	1.4	1.5	1.4

Table 4: *Zone of Tendon Injury*

Zone	Flexor	Extensor
1	10	4
2	26	8
3	1	9
4	2	2
5	13	7
6	x	6
7	x	3
8	x	2
Multiple Zones	6	5
Not documented	3	1

Table 5: *Injury Parameters*

Injury	Flexor injury	Extensor injury
Amount of tendon injured	46	33
Complete	14	13
Partial	1	1
Not documented		
Involvement of pulley		
Yes	12 (1 repaired, 11 vented)	N.A
Not documented	49	

Table 6: *Core suture type*

Repair	Flexor repair	Extensor repair
Kessler	8	1
Modified Kessler	40	24
Mattress	0	10
Cruciate	0	4
Continuous	2	4
Bunnell	1	0
Not Documented	10	4

Table 7: *Number of core suture strands*

Strands	Flexor Tendon	Extensor Tendon
2	19	12
4	5	7

Table 8: *Post-operative management*

	Flexor injury	Extensor injury
Splint used		
Yes	53	37
No	7	8
Not documented	1	0
Hand Physiotherapy duration (weeks)		
Minimum	0	1
Maximum	29	15
Average	7	6.6

Table 9: *Complications*

	Flexor injury	Extensor injury
Rupture	3	2
Stiffness	4	1
Stiffness and rupture	2	1
Tenolysis required	1	1
2 stage repair required	2	0

achieve, at the best, around 70-80% good and excellent results, with 10% of cases failing to achieve this because 5% rupture and 5% become adherent to the surroundings.

Over and above the technical difficulties of this surgery, the problem of tendon rupture and tendon adhesions are the major difficulties in the field of surgery[1]. Healing of flexor tendon takes about two to three months, which is sometimes longer than the period for which generally people refrain the hand from using, so the tendon repair snaps. The second problem of adhesions occurs because the body creates edema in any area of healing and the fibrin-filled edema fluid behaves like a soup of glue. While it works well to heal the structures, it leads to scar adhesions. This can affect the flexor tendons anywhere along their length to either reduce their excursion and reduce the range of motion of the digit, or, in 5% of cases, completely prevent any movement at all. This odema is marked more on the dorsum of hand than on the volar surface. This extensor adhesion prevents digital flexion because the extensor tendon cannot glide distally as the flexor tendons attempt to pull the digits into flexor. This extensor tethering, in conjunction with tightening of the dorsal capsule of the joints, is the main cause of poor results after primary flexor tendon surgery, although flexor tendon tethering can contribute.

Since longtime, surgeons has been trying to create a system which allow us to keep tendon repairs moving after surgery, to prevent adhesions. Because early movement may lead to rupture and defeat the aim, there has also been a need to create a suture and technique strong enough to allow this movement.

Flexor tendon repair contains core sutures and circumferential epitendinoussutures. Strickland[2], 3listed characteristics of an ideal primary flexor tendon repair as:

- Suture easily placed in the tendon
- Secure suture knots
- Smooth juncture of tendon ends
- Minimal gapping at the repair site
- Minimum interference with tendon vascularity
- Sufficient strength throughout healing to permit the application of early motion stress to the tendon.

A variety of suture materials have been used over the years but no best suture has ever been identified. The thickness of the suture has been investigated periodically. However, there is little one can vary; there is no doubt that finer sutures will snap more easily but thicker sutures are too big for the purpose of flexor tendon suture. So, a compromise of 3/0 core suture for larger tendons and 4/0 core suture for smaller tendons is the general rule.

Different people have described various core suture techniques over the years to achieve the above-mentioned aims (Figure 1). Tajima and Strickland variations of the Krichmayer/Kessler[4,5] suture, in which the knot or knots are buried in the tendon, are probably the most commonly used core suture technique in the Europe. The Tasuge suture, or Tang's[6] triple variation of it, is the most likely to be used in the Far East. As most of the published series of Zone 2 repairs in civilian population from all over the world have

roughly the same results, it would seem that most materials and most core suture techniques in common use work equally well.

It is clear that we need strength of 9-15 Newtons in our tendon repairs to allow us to use the Klienert 9-12 and Belfast[13-15] techniques of mobilization. However, if we want to prevent rupture in patients who use the hand early after repair then our sutures may need to resist 50 Newtons.

It has also been proven by the Laboratory work that Savage and Rissitano[16] 6 strand Kessler type of suture remains the strongest core suture we have but it is very difficult to use clinically, for which reason it is widely avoided in the clinical practice. Much of the work subsequently has been in trying to devise simpler multi-strand core suture technique, which is more practical, while retaining the strength advantage of the original Savage Rissitano suture.

The original aim of the epitendinous suture was to smooth down loose ends of the repaired to tendon in order to enhance gliding.[17-21] In 1986, Wade[22] realized that it also adds to the strength of the repair. In 1988, Lin and his colleagues[23] described the first strengthened epitendinous suture. This has led to about 5-6 variants being described over the last two decades with several laboratory trials on them (figure-2). These broadly show that a continuous suture, which is still commonly used, is the weakest of theses sutures, and certain innovative techniques of epitendinous sutures are comparable in strength to the core suture. In a laboratory study in 1996, Manske's team[24] studied tendons repaired solely with epitendinous sutures and recorded surprisingly high breaking strengths of up to 63 Newton. These newer techniques employ multiple gripping bites through the tendon, which is not unlike core sutures in principles, and they may be eight, ten or more of them. So we have another suture to use, not as a contender or alternative to the core suture as originally thought, but as a way of augmenting it. However, this study also showed that the more material there is on the surface of the tendon, the more friction there is on mobilization. So there is probably an upper limit to how much we can elaborate the epitendinous suture.

Many surgeons have advocated repair of the flexor tendon pulleys after tendon repair. Gelberman et al,[25-29] Lister,[30-32] Peterson et al,[33] Saldana et al,[34] Tang[35-37] and colleagues, and Tonkin[38] studied the advantages and disadvantages to flexor sheath repair. however, their work fails to provide any clear conclusions regarding pulley repair. The theoretic advantages of sheath repair are prevention of formation of extrinsic adhesions, and more prompt return of synovial nutrition, therefore resulting in better tendon–sheath biomechanics. The disadvantages are that it is often technically demanding, and that the repair results in a narrow passage that hinders tendon gliding. Duran and Houser[39] suggested partially releasing one side of the pulley on which a repair was catching. Strickland elaborated on this technique, introducing the term 'venting' the pulley, meaning cutting the side of it. There is still reluctance to allow venting of pulleys, especially A2 and A4, as these are important in preventing bowstringing, and in maintaining the mechanical efficiency of the flexor system. This belief takes origin from the fact that in doing secondary flexor tendon surgery, the minimum one need to preserve in flexor tendon reconstruction was an A2 and an A4 pulley. This practice was brought into primary flexor tendon surgery, that these two important pulleys must be preserved entirely. More recent research has demonstrated that there is no absolute need to preserve the A2 or the A4 pulley so completely, provided that the remaining sheath is intact.

Summary of the tendon management:

- Common trauma presentation
- Multiple flexor tendon injuries
- Core Suture 3-0 or 4-0 Proline as suitable
- Paratenon repair with 6/0 Proline as suitable
- Vent Pulleys on Radial aspect
- Referral to Hand Therapy on Discharge

Conclusion

We concluded that 2 strands modified Kessler repair with 4/0 Proline in small size tendons and 3/0 Prolene in large size tendons with 6/0 Proline over and over continuous epitendinous suture gives comparable results to other tendon repair techniques.

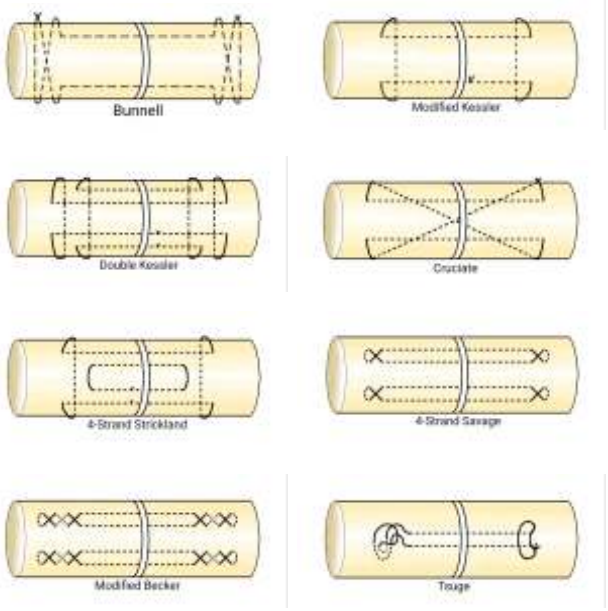

Figure 1: *Types of Tendon Repairs*

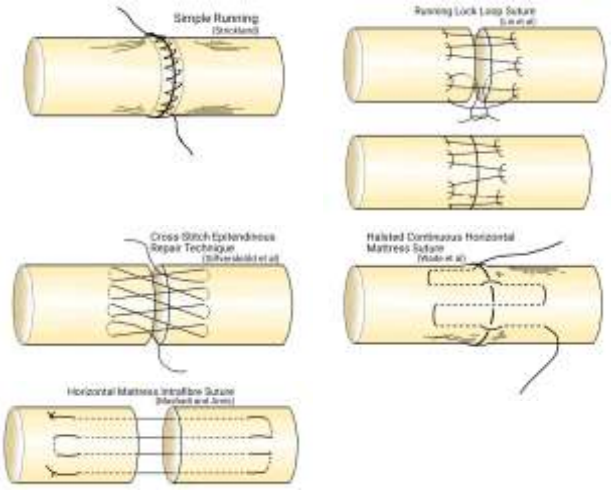

Figure 2: *Peripheral (Epitendinous) Tendon Suture Techniques*

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Research Article

THE RED CODE. A New Concept in the Prevention of Post-Surgery Bleeding of the Cleft Patient. A Multicentric Study.

Edwar Alvarez MD,[1] Usman Khalid Farooq,[2] David Alvarez MD,[3] Andrea Iñiguez MD,[4] Ghulam Qadir Fayyaz[5]

[1,3,4]Reconstructive and Aesthetic Plastic Surgery Service, [2]Continental Basic Hospital. Latacunga-Ecuador, [2]Department of Plastic Surgery / Mayo Burn Centre, KEMU, Mayo Hospital, Lahore, [5]CLAPP Hospital, Lahore

Abstract

Introduction: Bleeding, during post-operative period is not only frustrating for the surgeon but may also lead to life threatening condition for the patient. Sometimes if uncontrolled or not managed adequately can lead to death of patient. It's a worldwide problem as evident with articles from all over the world, especially dangerous in pediatric patients and more specifically cleft surgery patient post operatively.

Objective: The objective of the study was to determine an algorithm which can help in the management and prevention of postoperative bleeding cleft patients.

Methods: This paper presents the Red Code Algorithm, for pre, intra and postoperative management of cleft patients. The study was performed in different centers of Smile Train Foundation in Ecuador, Peru, Paraguay, Nicaragua and Morocco.

Results: We studied 864 primary and secondary cleft lip and palate surgeries, performed during one year by the same group of surgeons. In these 864 consecutive cases the Red Code Algorithm was applied. Forty-five patients (5.3%) presented more bleeding compared to the average of patients, and 2 cases (0.23%) required surgical re-intervention for hemostasis control. The control group had a total of 1243 patients, who had surgery by the same team before the introduction of the Red Code Algorithm. Of them, 113 cases (9.1%) presented more bleeding compared to the average, and 37 cases (2.97%) required surgical re-intervention to achieve hemostasis control.

Conclusion: This approach reduced the incidence of postoperative bleeding in all types of cleft surgeries.

Keywords | Red Code, Bleeding, Cleft surgery

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Corresponding Author: Edwar Alvarez MD

E-mail: edwaralvarezc@hotmail.com

Introduction

Bleeding during post-operative period is not only frustrating for the surgeon but may also lead to life threatening condition for the patient. He may even do revision surgery immediately to control the bleeding, which can be difficult to stop. Sometimes if uncontrolled or not managed adequately can lead to death of patient. It's a worldwide problem as evident with articles from all over the world, especially dangerous in pediatric patients and more specifically cleft surgery patient post operatively.[1]

Another aspect is cost of treatment of patients. It increases many a fold due to not only the demand of medical personnel's but also the operation theater items, gases and disposables

Many studies have been done previously in this aspect but not many specifically for cleft lip and palate

patients. In Levy's studies on cardiac surgery,[6,8] it was determined that about 4.7% of their cases needed re-exploration because of bleeding. In Jerrold study on trauma and orthopedics, percentage decreased to 1.9% as comparison to Levy's (RR, 0.44, 95% CI, 0.22 to 0.90), after applying their red code which also decreased morbidity and mortality.[8]

Reviews on cleft surgeries reveal that about 13% of them, presented an abnormal bleeding, and about 4.8% needed re-intervention to control hemostasis.

Experience has taught us that in most cases, "normal" postoperative bleeding stops after applying digital pressure for few minutes but sometimes due to any circumstance the bleeding restarts hours after the end of the surgery. This situation may lead to a late diagnosis and re-intervention with possible complications. On the other hand, the opposite situation may also occur: the patient may be rushed into the operative room to review bleeding under general anesthesia, and once the patient is intubated no further bleeding appears. Sometimes the bleeding is tried to be controlled with pharmacological drugs as evidenced with Levy's studies.[8] This shows us that we don't have a clear algorithm that allows us to decide either re-intervention without loss of time (negative false), or discharge positive false. So, this study is done to determine an algorithm which can be applied to the pediatric patients of primary and secondary cleft lip and palate interna-tionally for the better management in regard to the patient care.

Methods

It is a multicentric study performed from January 2019 to December 2019 for a period of one year in Ecuador, Peru, Paraguay, Nicaragua and Morocco, within each country Operation Smile Foundation and with the respective knowledge and approval of the corresponding medical directors, the Red Code, described below, was routinely applied for the prevention of postoperative bleeding in primary and secondary cleft lip and palate patients. 864 patients were included in the study and surgeries were performed by same group of surgeons. The results were compared with those from the same countries, from a period of three years, when the Red Code Algorithm was not yet applied. Following are the operational definitions.

Hemostatic Safety Bleeding (HSB)

For a "predictor" to know which volume of blood loss in a cleft surgery could leave the patient without enough coagulation factors, that the patient would need in the postoperative period if a major bleeding appeared. So, with this "predictor" we could define measures to control the loss of coagulation factors, and unnecessary transfusions, and revisions.[4]

Our study was able to define that cleft surgeries in patients whose intra-operative bleeding volume reached 10% of their total volume, needed the use of preventive measures, such as pro-coagulant medication, and others to avoid immediate surgical reviews and even blood products transfusions.

In our study we have adopted this value of 10% of the calculated total blood volume of each patient based on the HSI or Hemostatic Safety Index which, once reached, actives the Cleft Patient Surgery "RED CODE", setting in motion mechanisms focused on saving intraoperative coagulation factors, and eliminating false positives that confuse the diagnosis of persistent bleeding in the postoperative period.

Permitted Bleeding

This is the index that indicates the maximum amount of blood that a patient can lose until he reaches a minimum tolerable total blood volume. Once this value is exceeded the patient will need measures of blood replacement according to protocols; the Anesthesia Mexican Association has developed a calculator which, in an elective surgery, generally represents a value close to 20% of the patient calculated total blood volume.[5]

Alpha- and Beta-Adrenergic effect

Epinephrine acts in both α and β receptors causing vasoconstriction and vasodilation respectively. At high circulating concentrations α receptors cause vasoconstriction, an effect that is predominant for the first hour overcoming the beta effect. In the second hour, the low circulating levels of epinephrine produce stimulation of β receptors. It produces therefore general vasodilatation from the second hour until its effects disappear at the third hour.[11]

Tranexamic acid

Tranexamic acid is an active hemostatic agent which can be administered orally and parenterally. It has

effects similar to those of aminocaproic acid, but it is about 10 times more potent as an inhibitor of plasminogen activation, reducing the dissolution of hemostatic fibrin by plasmin.

After an administration of 1300 mg of tranexamic acid, the maximum plasma concentrations are reached after 3 hours. Absolute oral bioavailability is approximately 45%. A decrease in plasma levels is observed according to a triexponential equation, with a half-life of elimination of about two hours. After intravenous administration of 10 mg / kg, approximately 90% of the dose is eliminated in about 24 hours.[11]

In general, 1.4% of the patients presented adverse reactions such as nausea and vomiting, diarrhea, hypotension, dizziness, visual abnormalities and alterations of the retina. Venous and arterial thrombosis and thromboembolism have also been reported, as well as obstructions of the retinal artery and vein. Urethral obstructions have also been described occasionally due to formation of clots in patients with upper urinary tract hemorrhage.

Aminocaproic acid

Aminocaproic acid belongs to a class of medications called pro-hemostatic. It works by slowing the disintegration of blood clots. (MedlinePlus, 2010). It is used to control bleeding that occurs when blood clots dissolve too quickly. This type of bleeding can occur during or after surgery of the heart or liver, in people with certain bleeding disorders; in people with prostate, lung, stomach or cervix cancer and in pregnant women with abruptio placentae. Aminocaproic acid should not be used to treat bleeding that is not caused by rapid disintegration of a blood clot.[11]

Red Code Algorithm

It is important to understand that not all surgeries have the same bleeding risk, for example the palate surgery is riskier due to vascularization, which is very rich. The lip repair has minor risk but it exists.

The bleeding prevention in cleft surgery will begin in the preoperative, and continue in intraoperative and postoperative phases.

Preoperative Phase

It consists of integral clinical evaluation to assess the presence of patients with bleeding risk. In this phase it is imperative the role of:

The Pediatrician. – They must specify clinical conditions involving coagulation disorders such as Von Willebrand disease, mild hemophilia A, congenital disorders of platelet function: Bernard Soulier syndrome, vascular disorders: Ehlher Danlos, Marfan syndrome, Wilms tumor, myelin and lymphoproliferative diseases, hypothyroidism, congenital heart disease.

The Anesthesiologist. - They will determine the Permitted Bleeding value of the patient, according to weight, the real hematocrit and the minimum value the patient can reach. This value is usually around 20% of the total blood volume. The Hemostatic Safety Bleeding value will be around 10% of this volume.

They will also determine as usual other parameters of importance relating to airway manage and difficult airway patient.

The Cleft Surgeon – In this phase, they will evaluate the extent, complexity, and the possible bloody areas of the surgery.

Intraoperative Phase

In this phase the whole teams work together to evaluate the intra-operative bleeding.

Auxiliary Nurse:- In order to assess the exact amount of blood loss, the Auxiliary Nurse will quantify the amount of blood collected in the suction container (having previously verified it was empty at the beginning of the surgical procedure) and in the gauzes and compresses used (counting them, knowing that one completely wet gauze contains 10cc of blood). They will also quantify the saline used for surgical irrigation when considering the liquid collected in the suction container. In case the blood loss exceeds the previously defined HSB value (Hemostatic Safety Bleeding value) for that patient, the "Red Code" will be activated.

In order to quantify how much blood is contained in a gauze or compress, we have carried out field tests to define that value. We concluded that each square centimeter of gauze with four layers is impregnated with one gram of blood. (Fig. 1)

Fig. (1) *Blood Soaked Gauze Weighted on the Scale*

Also, each square centimeter of gauze is impregnated with one cubic centimeter of blood (Fig. 2)

Fig. (2) *Each Gauze Placed on a Sheet and Impregnated Blood Measured*

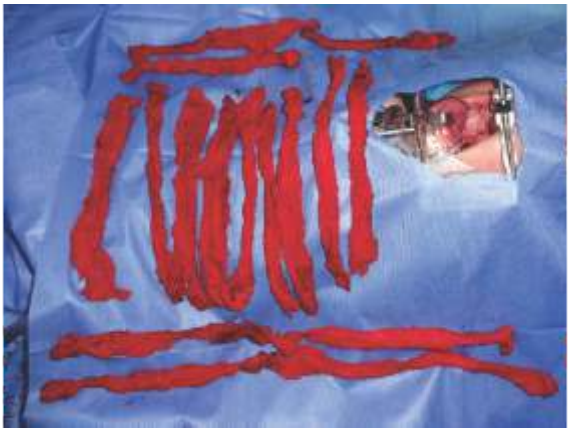

Fig. (3) *Total Number of Soaked Gauzes*

Scrub Nurse. - They must quantify the saline solution used during the surgery, and must also count the number of gauzes used (completely wet gauzes, as shown in (Fig. 3) in order to eventually determine the intra-operative blood loss. If the value exceeds the patient HSB, the RED CODE will be activated, and adequate treatment started according to our Red Code Algorithm.

Photographer- Photographic records of the cases will be examined. The purpose is to document the bleeding through pictures (the gauzes used and the blood collected in the suction container, and any other measure taken (flushing of the surgical field, bloody gastric content...)

Anesthesiology, Pediatrics, Nursing- Once the Red Code has been activated intra-operatively, the reasons for the bleeding shall be verified for quantification of that bleeding (recount of gauzes, suctioned blood, etc.) for definitive quantification.

Medication shall be initiated as indicated in the Red Code Algorithm: Dexamethasone, Tranexamic Acid and Ondansetron. Antibiotics in therapeutic dose should also be initiated.

Quantification of the bleeding will continue until the end of the surgery

Cleft Surgeon- The surgical team leader might assist the surgeon performing the surgery in assessing the case, identifying the reasons for the bleeding and controlling it. They will follow the Red Code Algorithm.

At the end of the surgery, the surgeon should flush with saline the oral and nasal cavity to remove the clots, and aspirate the pharynx and gastric contents (Fig. 4). If this procedure is not done, it could mislead us, because it might be from previous intra-operative bleeding or be new.

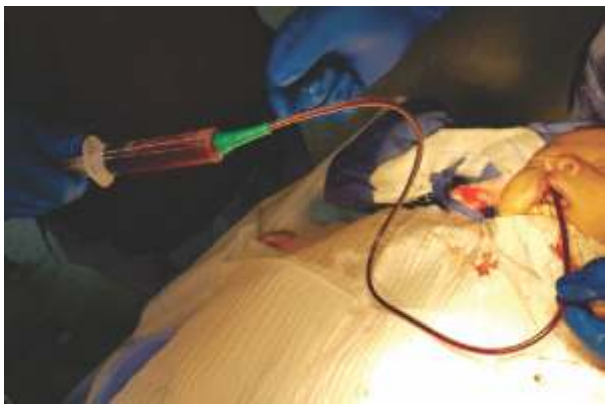

Fig. (4) *Pharyngeal and Gastric Contents being Aspirated*

If the bleeding was not adequately controlled, a palatal pack will be secured and left in place during the next six hours and a nasopharyngeal catheter will be placed to facilitate oxygenation (Fig. 5)

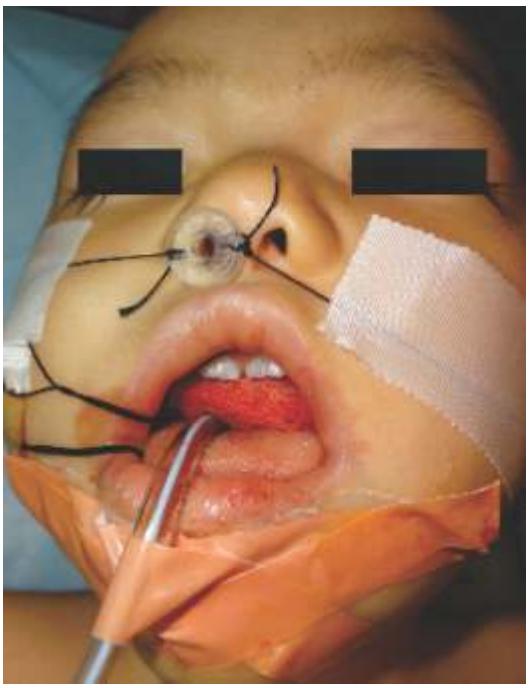

Fig. (5) *Nasopharyngeal Catheter Secured after Palatal Pack Placement*

The surgeon in charge of any children with severe bleeding should anticipate ulterior coagulopathy due to coagulation factors consume because of that bleeding. They should therefore focus their efforts on achieving hemostasis as quickly as possible. Early intervention should be done to prevent the consequences of hemorrhagic shock: hypothermia, acidosis and hemodilution.[12]

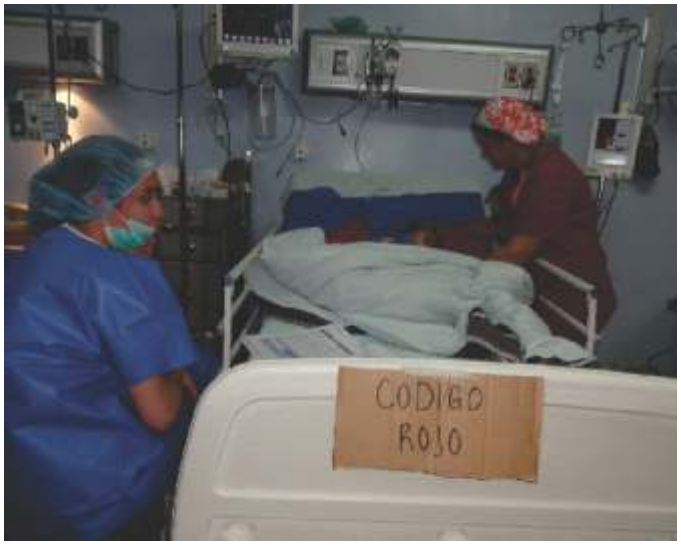

Fig. (6) *Recovery area for post-operative patients*

Postoperative Phase

Once the surgery is concluded and under the conditions previously mentioned, the patient will be taken to a predetermined place in the recovery area (Fig. 6)

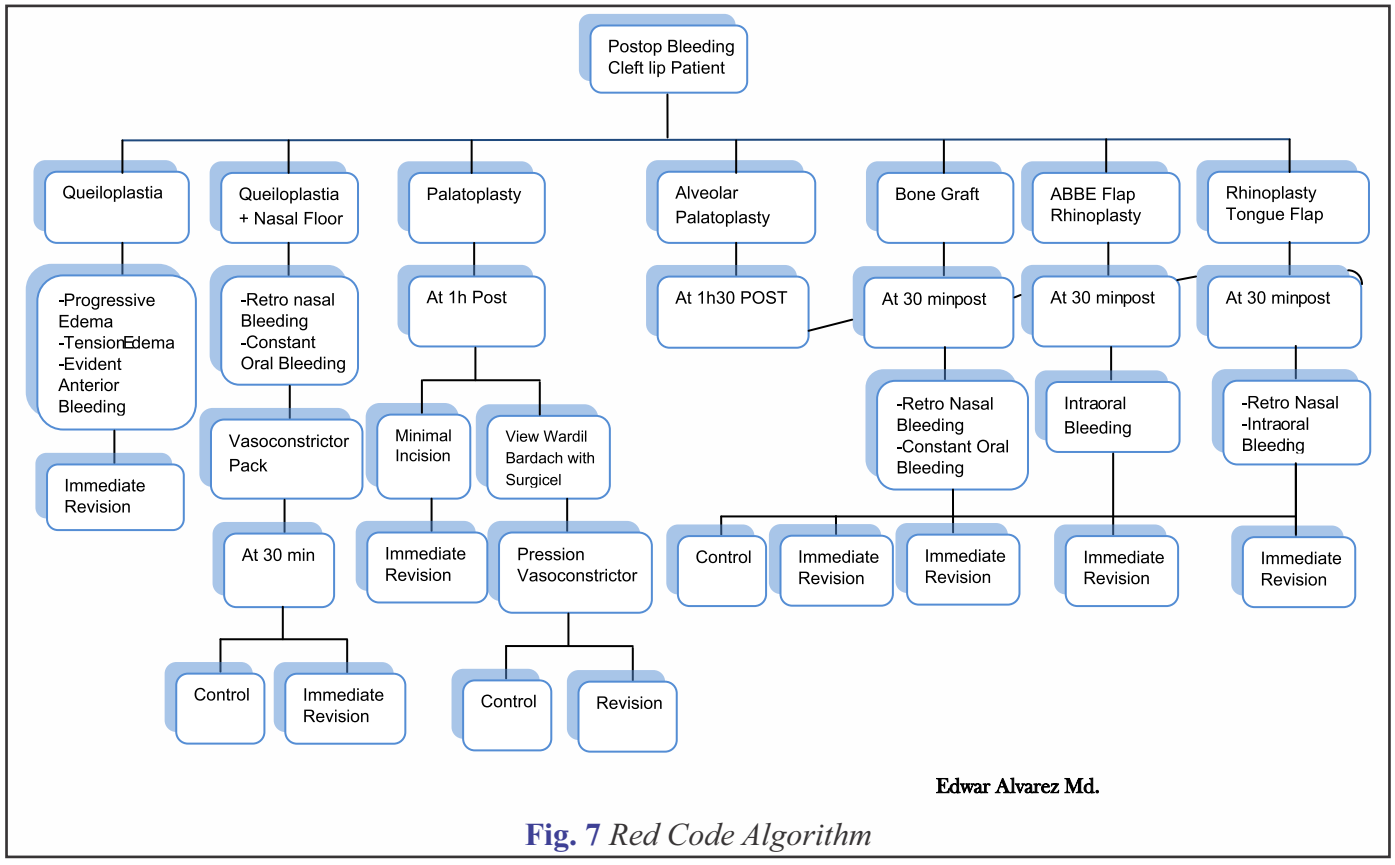

Fig. 7 *Red Code Algorithm*

where the personnel, that is nurses, emergency doctor or intensive pediatrician will be in charge for immediate postoperative management.

In this area there will be a scheme with diagnostic and therapeutic suggestions (Red Code Algorithm). (Fig. 7)

When the patient is in hospitalization and has stayed six hours without any incident, the Red Code is suspended; at that moment the patient will receive the last dose of Antifibrinolytics.

Results

We studied 864 primary and secondary cleft lip and palate surgeries, performed during one year by the same group of surgeons. In these 864 consecutive cases the Red Code Algorithm was applied. Thirty-five patients (5.3%) presented more bleeding compared to the average of patients, and 2 cases (0.23%) required surgical re-intervention.

The control group had a total of 1243 patients, who had surgery by the same team before the introduction of the Red Code Algorithm. Of them, 113 cases (9.1%) presented more bleeding compared to the average, and 37 cases (2.97%) required surgical re-intervention to achieve hemostasis control.

Being a case-control study, it is correct to obtain the Odds Ratio estimate to demonstrate, statistically, the association between the possibility of postoperative bleeding in these patients by not applying the RED CODE with its respective protocol. The following table (Table: 1) of 2X2 and the mathematical determination of the Odds Ratio are presented:

	Post Surgical Bleeding	No Bleeding
No Red Code	37	1130
Red Code Applied	2	862

$$OR = \frac{a/b}{c/d}$$

OR= 0.032 / 0.0023

OR= 13.9

Meaning; there are 13.9 times more likely to present post-surgical bleeding when the red code is not applied

Discussion

Bleeding is considered as a major problem is cleft surgeries especially in cleft palate. And because of this reason the patients are kept in ICU for the immediate post-operative period for 6 hours up to 1 day.

Surgically reviewing a cleft lip and palate patient in the immediate postoperative period has a high morbidity, whether determined by an early diagnosis (false positive), but also in those where a late decision was taken (false negative).

Administering antifibrinolytic therapy to all patients to avoid this complication has also risks. There is no scientific evidence to support it. This medication has also important undesirable effects.

In our study, we found that activating the Red Code in those patients who bled above the HSB value was effective. It allowed us to choose those patients who would need additional procoagulant and supportive measures. We implemented the measures described in our Algorithm.

Our studied showed a reduction in review surgeries from 2.97% in our control group to 0.23% in our Red Code Algorithm group.

Our next goal is to implement this Red Code Algorithm in other centers and in from different countries, in order to study its applicability and reproducibility, and improve or even adjust or modify it. Also we need more patients for statistically significant and consistent conclusions.

Conclusions

From the results obtained in this study we conclude that blood transfusion prevention protocols applicable in complex surgeries, such as scoliosis, cardiac and craniosynostosis, are also applicable in cleft surgery, with the same validity.

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Research Article

Third Generation Veloplasty: Elongation of the Soft Palate, A New Concept and Technique

Edwar Alvarez MD,[1] Romaisa Shamim Khan,[2] David Alvarez MD,[3] Andrea Iñiguez MD[4], Muhammad Daiem[5]

[1,3,4]Reconstructive and Aesthetic Plastic Surgery Service Continental Clinic. Latacunga-Ecuador, [2]Department of Plastic, Reconstructive Surgery and Burn Unit, Mayo Hospital, KEMU, Lahore, [5]Agha Khan University Karachi

Abstract

Background: Adequate reconstruction of the soft palate to achieve quality of phonation is one of the main objectives of cleft palate repair. Even with adequate repair, the soft palate may remain short, leading to Velopharyngeal Insufficiency. In such cases lengthening is achieved by sacrificing other important anatomical structures.

Objective: We present a new technique in the reconstruction of the soft palate that elongates it in an efficient way providing adequate sufficiency and uvular competence, without sacrificing other palatal structures.

Methods: During a five-year period, this technique was applied to a total of 731 patients, 437 in primary repairs and 294 in secondary or revision cases. All patients were subjected to a quantitative analysis with the "Alvarez Scale" or Speech Score both before and after surgery.

Results: There was a notable improvement in our series in the prevention and treatment of Velopharyngeal insufficiency (VPI). There was a gain of one to two points (over fifteen) in improvement as compared to what the revision group had in their preoperative evaluation.

Conclusion: In our experience, the Third Generation Veloplasty (TGV) is more effective in improving the velopharyngeal function than the first generation Veloplasty (OR = 2.76)

Keywords | Velopharyngeal insufficiency (VPI), First Generation Veloplasty (FGV), Second Generation Veloplasty (SGV), Third Generation Veloplasty (TGV), Uvular insufficiency (UI), Uvular incompetence (UIc), Speech Score (SS)

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Corresponding Author | Edwar Alvarez MD

Email: edwaralvarezc@hotmail.com

Introduction

From the beginning of palatal reconstruction, surgeons sought the three-layered anatomical reconstruction of the congenital defect between the oral and nasal cavities.[1,2] This fundamental principle in the repair of the cleft palate has not changed since Bernard von Langenbeck.

With respect to the bony palate, the reconstruction has evolved in the form of wide dissection techniques, such as Veau-Wardill and Bardach. Current methods also include conservative techniques with minimal incisions that have taught us to temper surgical procedures by dissecting what is strictly necessary to achieve repair of the defect with minimal scars. We have described these as the Surgical Philosophy of the Palate, or cut as you go.[3,4,5] These methods have shown encouraging results, however, they have a long learning curve.

Despite adequate closure of the palatal cleft, speech disorders are quite common in these patients. Hence, there is a need to look for reconstructive alternatives in order to improve functional results.[6,7,8]

To understand the cleft palate malformation, it is important to relate the pathology with anatomical

basis of the cleft. Lack of complete fusion of the medial palatal processes of the first pharyngeal arch is the origin of the hard palate cleft. This results in a communication between the oral and nasal cavities. Defects at the osseous level will result more in food leakage and less in speech problems. The repair of this bone segment has structural purposes.[8,9,10] An adequate repair will alleviate the symptoms of food leakage into nasal cavity.

The structures comprising the soft palate have a different purpose. The tensor muscles of the palate are important in swallowing, and sphincter control of the Eustachian tube. The elevator muscle of the palate has a major role in phonation. Finally, the intrinsic muscle of the uvula, the estafilino Uranus, completes the last elevation phase of the palatal veil until its complete posterior closure. For these reasons the repair of the soft palate has more functional than structural purposes. The aim here is to reconstruct the integrity of the fissured muscles.

Subsequent to the original description of cleft palate repair, modifications and different techniques were added. These techniques sought to improve speech results in the cleft palate patient. Here it is pertinent to add that there is no universal system that classifies the various veloplasty techniques. Therefore, we have grouped them in the following system for purely educational purposes, and to be better able to describe the novel technique used in this study.

First generation veloplasty: Since its original description of by Bernard von Langenbeck (1810-1887), the aim of veloplasty is repair of the palatal veil elevator with the Intravelar Veloplasty technique,[3,11] This undoubtedly provides the solution to velopharyngeal Incompetence. Results demonstrate that this technique leads to a secondary problem due to scar contracture: a functional but short palate. A short palate in itself is a cause of Velopharyngeal insufficiency (VPI). In summary, the Intravelar Veloplasty resolves the Incompetence of the cleft, but not the VPI.

Second generation veloplasty; This is an evolution of the previous one, with the additional purpose of lengthening the palate, while still repairing the muscular sling. Second generation techniques include the Push-back procedure, Furlow's double-opposing Z-plasty (figure 1) and the Sannvenero-Roselli technique(figure 2).

This generation of veloplasty techniques managed to repair the muscular sling AND gain adequate palatal length, but always sacrificed some structural anatomical component. For instance, the Push Back technique increases the anterior Dental palatine fistula rate. The Furlow technique affects the competence of the estafilino Uranus muscle, and in the Sannvenero-

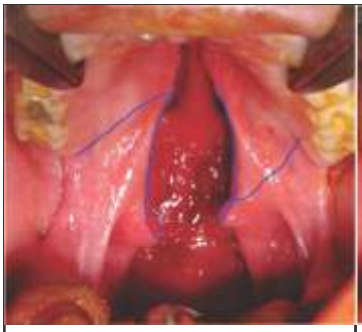

Fig 1: Marking for Furlow's double-opposing Z-plasty

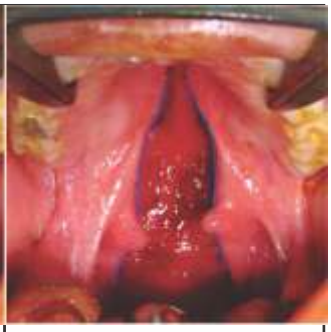

Fig 2: Sannvenero-Roselli technique

Third generation veloplasty: In order to achieve the objectives of muscular competence and adequate palate length without compromising structural anatomy, we propose the '3rd generation veloplasty'. It recovers ideal palate intrinsic muscle positions of tensor and levator veli palatini, and the Uranus estafilino muscle. Imaging and histopathological studies show that the Uranus estafilino muscle intervenes in the third and last phase of the soft palatal lift process, concluding the sphincter constriction. For this reason, we think it is necessary to preserve and reconstruct the uvula using both halves and not discard any part thereof.

Methods

The study was conducted over a five-year period in Ecuador and simultaneously over a two-year period in Peru, Paraguay, Nicaragua and Egypt within the Operation Smile Foundation of each country. Approval was obtained from the respective medical directors. The Third Generation Veloplasty (described below) was routinely applied in all cleft palate patients, including both primary cases, as well as previously operated patients who were candidates for a re-do palatoplasty.

Speech samples were recorded for all patients pro-operatively, as well as post-operatively. Speech assessment was done using the Alvarez score. The primary cases had at least a 3-year follow-up, and the secondary cases had a one-year follow-up. The results of this technique were compared to that of a 'control group', comprising of patients who underwent first generation veloplasty (intravelar veloplasty method), before we started implementing the current technique

The relative risk was calculated, for development of VPI with first generation technique versus third generation technique. The odds ratio for improvement of VPI with third generation technique was also calculated.

Surgical Technique

With the patient in Rose's position and a Dingmann mouthpiece in place, the soft palate was infiltrated with a solution containing 0.25 mg of bupivacaine and epinephrine 1: 100,000. After waiting for a latency period of seven to ten minutes, de-epithelialization along the medial border of the cleft uvula was done on both sides, as shown in figure 3.

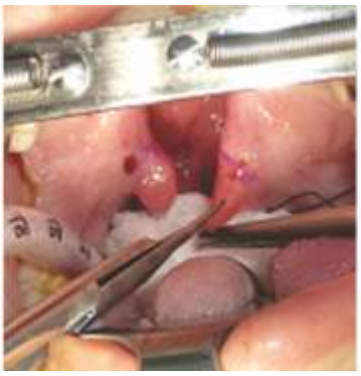

Fig 3: *De-Epithelialization Along the Medial Edges of the cleft uvula*

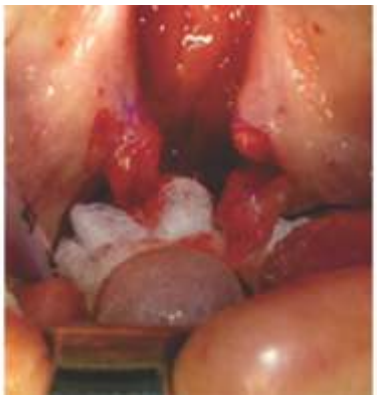

Figure 4: *A full thickness, 1 cm Long Cut made Parallel to the Posterior Border of the Uvula*

Once this step is done, fibers of the Uranus estafilino muscle can be clearly seen from the base of the uvula. After that a full thickness cut that involves the oral mucosa, uvular muscle and nasal mucosa has to be made; the path and direction of this cut will be parallel to the posterior border of the uvula no further than one centimeter as shown in Fig. 4.

Once this cut is made on both sides, that is to say on each palate hemi-veil, the remaining uvulas are pushed towards the posterior pharyngeal wall forming a rhombus. This defect is closed in the midline with absorbable vicryl 6/0 sutures.

With consequent suturing of this rhombus, there are two effects: firstly the contact surface of the elevator and Uranus estafilino muscles increases, ensuring adequate competence. Secondly, through the Rose-Thompson effect there is elongation of the soft palate. (Figure 5 and 6)

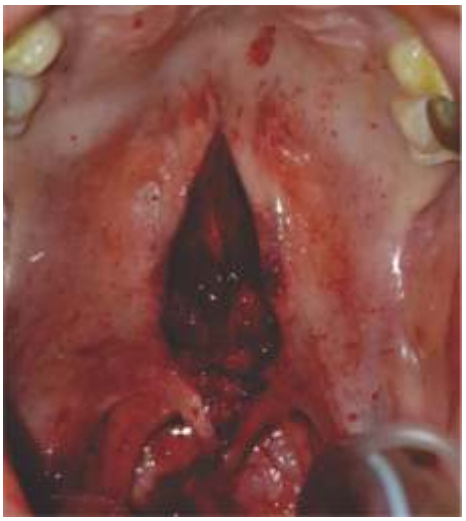

Figure 5: *Creation of Rhomboid Defect*

Results

A total of 731 patients were treated with the third generation veloplasty technique. The control group included a total of 484 cases, treated with Intravelar Veloplasty technique (First Generation Veloplasty). The details of both these groups are elaborated in Table 1. The phono-audiological follow-up during three post-operative years in primary cases and one postope-rative year in secondary review cases detected a two-point improvement in the Alvarez speech score (Table 2).

The odds ratio analysis shows that the Third Gene-

rationVeloplasty (TGV) is 2.76 times more effective in improving the velopharyngeal function than the first generation Veloplasty (Table 3). Our results also demonstrate that patients are 4.93 times more likely to develop VPI using First Generation Veloplasty as compared to third generation (table 4).

OR = 4.5 / 1.63OR = 2.76

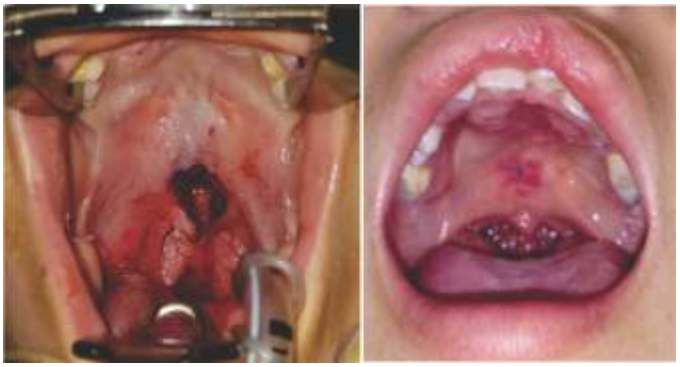

Figure 6 *a: Prior to Suturing of the Rhomboid Defect, and*
b: Rose-Thompson Effect Demonstrated 2 Months Post-Operatively)

Discussion

Repair of the cleft palate has continued to evolve over the last century, with techniques aimed at restoration of the structure as well as function of the palate to resemble the norm as closely as possible.

Earlier (first generation) techniques, restored the muscular sling but resulted in a short palate[3]. To overcome this problem techniques were developed to simultaneous lengthen the palate and restore the muscle sling. However, most of these sacrificed some crucial anatomical structure. This left room for an 'ideal' technique that would meet the objectives of repair, namely, muscle repositioning, adequate palatal length, while not compromising on integral palatal structures.

Table 1: *Comparison of Demographics of the 3rd and 1st Generation Veloplasty Groups*

	3rd generation veloplasty group	1st generation veloplasty group
Total patients	731	484
Primary cases	437	484
Male	57% (249)	39% (189)
Female	43% (188)	61% (295)
Unilateral	61% (267)	72% (349)
bilateral	39% (170)	28% (135)
Secondary cases	294	NA
Male	36% (112)	
Female	62% (182)	

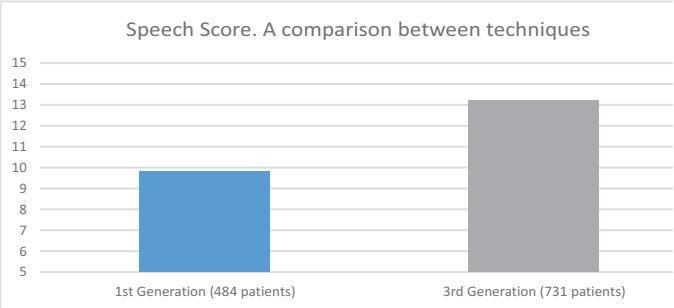

Figure 7: Comaprison of Speech Scores between the two groups.

Table 2: *(odds ratio analysis): Third Generation Veloplasty (TGV) is 2.76 times more Effective in Improving the Velopharyngeal function than the First Generation Veloplasty.*
RR=0.69/0.14; RR=4.93

	Improved Speech	Did not Improve Speech
3rd Generation Veloplasty	598	133
1st Generation Veloplasty	300	184

Intelligible speech production is one of the most important goals of cleft palate repair. Innovations in existing surgical repair techniques aim towards improving quality of speech. With advances in objective speech assessment tools, one is able to attribute particular aspects of a surgical technique to improved speech outcomes. This study successfully demonstrated the advantageous effect on speech of the "3rd generation veloplasty'. Results of this study demonstrate that patients are 4.9 times more likely to develop VPI if undergoing first generation techniques versus the 3rd generation veloplasty technique

Table 3: *Relative Risk:Patients are 4.93 times more likely to Develop VPI using First Generation Velo-plasty as Compared to third Generation.*

VPI DEVELOPED GENERATION	YES	NO	TOTAL
First	334	150	484
Third	105	626	731
TOTAL	439	776	1215

This technique is partcularly useful as it can be incorporated into pre-existing palatal repair techniques,

without any added morbidity as it does not sacrifice other anatomically important structures of the palate where important modulations of sounds for speech are made.

Conclusions

The Third Generation Veloplasty concept has allowed us to teach our residents the logical objectives of Soft Palate repair, which are adequate length and motor capacity. This also highlighted the importance of the estafilano uranus muscle in the final part of the palatal lift process.

The Speech Scale proposed by us serves as an auxiliary mechanism to evaluate the effect of the muscular repairing technique.

This technique has provided us with a new way of performing Veloplasty, which can be integrated to any other previous technique. Nevertheless, larger multicentric studies to further evaluate the results of this technique are required.

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Editorial

Challenges and Opportunities of Distant Learning in Plastic Surgery

The Corona Virus Disease of 2019 (COVID-19) pandemic has placed the medical world in unfamiliar territories. Traditionally, the medical teaching system depends upon in-person classes for the exchange of knowledge between residents and faculty. Grand rounds on actual patients are the epitome of resident training. The limitations of social distancing prevent us from following this model of education, which may lead to unfavorable effects on resident training.

Consequently one must adopt alternate modes of learning to bridge this gap, without incurring risk of coronavirus exposure. Globally, this has mostly been in the form of online meeting rooms that allow for a large number of people tomeet and interact face-to-face. Distance learning has been studied in the literature, and 3 kinds of interactions leading to learning identified: interaction with content, interaction with instructor, and interaction among peers (1). No doubt there were initial setbacks and challenges in adapting this on a regular basis.Stable internet connections and presence of appropriate equipment are examples more relevant to our country. However there are some unique opportunities that distance learning has provided. The ability to directly interact with the presenter keeps the audience engaged (2). Residents can benefit from being taught by subject masters from other countries. Even within a country we can hold meetings on a national level and provincial level. With the travel and lodging expenses eliminated, maximum participation can be achieved in these meetings.

Online learning can be likened to opening up a portal to the rest of the world, with no geographic limitations. Hopefully, this will continue in a hybrid form beyond the pandemic, where we can incorporate it into our traditional learning methods such that we can all benefit from the additional opportunities provided by distance learning.

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 from the 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.

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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 Plastic Surgery 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'.

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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.

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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.

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