

Research Article

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

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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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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 contracture.⁴ Although the injectable collagenase has shown promising results for correction of MCP joint contractures, but recent studies have shown that injectable collagenase. Percutaneous needle aponeurotomy for DC has many benefits. It is a minimally invasive technique, with rapid healing and recovery time allowing early return to work. There is also reduced need for formal occupational 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 duration 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 the Dupuytren contracture cannot cure the disease rather 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 improved function and increased range of motion, even without achieving full extension.¹ Reported recurrence 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 as the 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 Werker⁸ 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 followed up by a mean follow-up duration of three years. Furthermore, Herrera et al.⁵ 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 Verstreken¹² reported the results of 33 patients treated by combining PF with the open palm technique after a mean follow-up of 2.5 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 Rijssen⁶ 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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