Single Slip Sublimins Transfer for the Management of Post-traumatic Swan-neck Deformity of the Fingers; Preliminary Study of a Newly Proposed Technique

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Summary:

Background: *Swan-neck deformity of the fingers is a cause of functional and cosmetic deficit for most of the patients, the main pathology lies on the PIP joint and most of the surgical treatments depends on the integrity of the soft tissues around it including sublimins tendon that plays an important role in the success of most of the surgical procedures.*

Aim: *to describe anew surgical technique for the treatment of post _ traumatic swan-neck deformity in the fingers.*

Subject & methods: *nine patients with post-traumatic swan-neck deformity with intact (FDS) were included in this study. The operation included transferring the insertion of one slip of the sublimins to the A4 transverse pulley.*

Results: *this allowed a more dynamic PIP and a better hand function in comparison with other known operations.*

Conclusion: *further studies with larger sample & longer period of follow up may give better & more accurate results about this new procedure that can be regarded as a modified Tonkin technique.*

Introduction:

Swan-neck deformity is described as flexion posture of distal interphalangial joint and hyperextension posture of the proximal interphalangial joint (PIP) with flexion at times of the metacarpophalangial joint (MPJ), the main pathology is in the PIP , sometimes the deformity is passively correctable depending on the fixation of the original and secondary deformities (fig.l). (1)

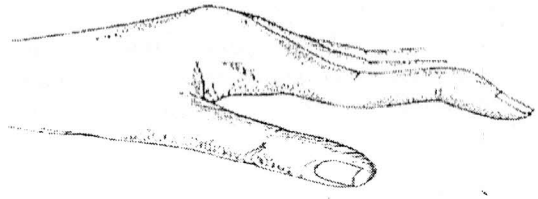

Fig.1; swan-neck deformity (1)

Finger flexors composed of the flexor digitorum superficialis or sublimins (FDS) and flexor digitorum profundus (FDP), those enter the finger through the fibrous flexor sheath (FFS) with the FDS volar to the FDP. Over the middle phalanx the FDS splits in two slips which flatten and spiral around the profundus tendon and inserts on the sides of the whole middle phalanx (fig 2) (2) Each slip of the FDS receives its blood supply through two vinicula, one small and non-important vinculum near its insertion to the middle phalanx, the other is large doubled from the volar aspect of the proximal phalanx which is a large and important one (fig. 2). (2)

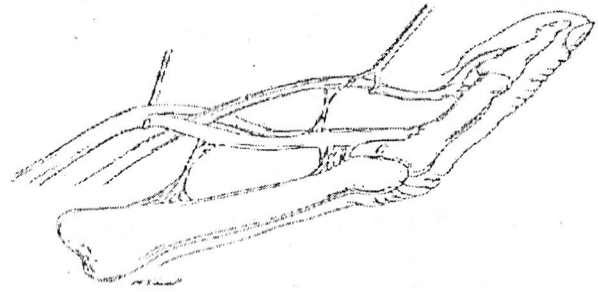

Figure2; flexor tendon insertion And its blood supply through the vinicula (3)

the flexor tendons pass through a group of fibrous oblique C & transverse A pullies , the A4 pulley on the middle phalanx is of importance in this study (fig.3).(2) .

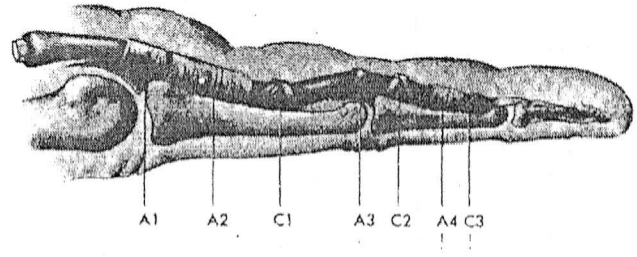

Figure 3; the transverse and oblique Pullies of the flexor tendons (1)

Of the causes of swan-neck deformity rheumatoid arthritis is the commonest while trauma is only a minor cause. The minor Post-traumatic deformity is the interest of this study.

The pathological effects of the PIP in post-traumatic swan-neck deformity are; palmer plate stretching or rupture, extensor plus as with prolonged mallet deformity and/or flexor minus after stretching or rupture of superfecialis. Cases of

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superfecilis rupture dose not suit our proposed procedures. (4)

Both the cosmoses and functional loses in swan-neck deformity brings the patient under medical care especially in younger people or those who need fine hand and finger movements in their work.

In this study we aimed at describing a new surgical technique for the treatment of post-traumatic swan-neck deformity in the fingers by transferring the insertion of one slip of the sublimins to the A4 transverse pulley.

Patients and Method:

Through the period from June 1999 to October 2002, nine patients with post-traumatic swan-neck deformity with intact FDS were operated upon at the Medical City of Baghdad/the Hospital of specialized surgeries/the department of fracture and orthopedics; pre-operatively all the patients were clinically assessed to exclude causes other than trauma and to ensure the integrity and power of the FDS, the PIP must have full or near full range of passive and active or assisted active flexion.

Anteroposterior and lateral X-rays of the affected finger is taken to assess the PIP that should be intact and not degenerated or fractured.

The operation is done under general anesthesia and tourniquet, a zigzag incision done over the middle and proximal phalanges avoiding injury to the digital vessels and nerves, flaps are retracted the A4 transverse pulley on the middle phalanx is identified the radial slip of FDS is usually selected and its insertion on the side of the middle phalanx is dissected and the slip is cut free just proximal to the A4 pulley. Then the free slip is passed under the A4 or through a small transverse slit in the middle of the A4 pulley and turned back to be sutured on itself and on the pulley with fine non-absorbable 4-0 sutures; the tendon is sutured with suitable tension that keeps the PIP in about 5-10 degrees of flexion with MPJ extension. The PIP is fixed in about 10 degrees of flexion by a fine K-wire and the wound is closed and dressed.

By this procedure we correct PIP extension and prevent its recurrence whereby allowing free powerful PIP flexion at any position of MPJ with possible PIP extension in MPJ flexion; this allows good range of PIP movement with minimal limitation of extension, it also gives better and powered hand and finger function.

10-14 days Post-operatively the K-wire and skin sutures are removed then patients seen weekly for a month, every two weeks for anther month, and monthly for three months, all depends on patient compliance, some of them lost at earlier
stages of follow up and could not be.included in this study.

Physiotherapy is started in the form of gradual passive PIP flexion; PIP extension is allowed in MPJ flexion only. Assisted active flexion and extension is started as soon as the patient is pain free and gradually increased until the maximum possible range, this is usually gained after 6-8 weeks. Frequent wax bathing is useful to decrease pain, overcome post-operative swelling and improve the painless range of motion.

Results:

The patients were five males and four females aged from 19-45 years average of 29.7 years. All of them had history of trauma, three had neglected mallet finger with secondary swan-neck deformity.

Time of presentation after trauma ranged from 3-10 weeks average of about 18.11 weeks. There were 3 indices, 4 rings and 2 middle fingers of one female sewer, a male mechanic, a driver, a carpenter, two handymen, two housewives and a young female student.

The longest recorded follow up period in this study was 1 years; while the shortest period was 8 weeks. Early postoperative results gained at 6-8 weeks.

Complications occurred in three patients, one had superficial wound and pintrack infection with subsequent PIP stiffness at 25degrees of flexion. Second patient had PIP stiffness at 20 degrees of flexion because of poor compliance and refusal of physiotherapy; he is the same patient whom we lost after 8 weeks of follow up. The third had localized flap-edge necrosis and superficial skin infection treated conservatively without interference with function or position.

Cosmetic and functional outcome was good and well accepted by all patients even those who had mild stiffness, clinically we registered good functional outcome that is more dynamic and useful for the patients than other well-known and useful surgeries.

Discussion:

Post-traumatic swan-neck deformity is uncommon and infrequently seen in practice, it occurs following specific localized trauma causing volar plate with or without sublimins stretching or tear leading to gradual hyper-extension of PIP which is actively correctable by FDS to start with, but later on there is sever hyper-extension that is beyond sublimins active flexion. With time maintained hyperextension is irreversible due to secondary soft tissue changes. (1,3)

Those patients when presents early can be managed simply by splintage and when presents late secondary changes makes operative treatment inapplicable; although preoperative manipulation or splintage can correct milder degrees of stiffness (5,6). The sample in this study was small because of infrequency of the post-traumatic deformity and the limitations we faced regarding the time of presentation following trauma. Patients usually present because of cosmoses or functional impairment.

FDS transfer in rheumatoid patients found to be sometimes the cause of such deformities like swan-neck, so those patients where excluded from this study(7).

Swan-neck deformity can occur secondary to mallet deformity, mallet finger when present early can be managed by splintage if untreated after 6 weeks it ends in chronic mildly flexed DIP that is functionally not very much disturbing but as secondary swan -neck deformity develops, severe cosmetic and functional losses will be noticed and this indicates intervention to prevent progression of the primary and secondary deformities and improve the hand and finger function. After sublimins transfer a better function and cosmoses

The Curtis tenodesis is nearly similar but more invasive than Beckenbaugh technique it carries the same possible complications and disadvantages (fig.5).(l,9)

PIP arthrodesis is anther possible choice for the management of primary swan neck deformity and failed or complicated soft tissue surgeries. The optimal arthrodesis position depends on the ability of MPJ extension in such a way that the PIP position will not prevent the finger from acquiring a flat position with other digits (usually less than 30 degrees PIP flexion). (4)

This study describes a more lively and rather dynamic procedure that prevents PIP hyper-extension and allow active flexion and extension giving more dynamic and functional results, all the patients returned to their work including those indulged with heavy activities, non of them needed further surgical intervention. It's a relatively simple, effective and attractive treatment for swan-neck deformity. Excellent to good results had been described by Tokin et al in 1992 where they used a nearly similar technique by which a single slip of FDS is released and attached to the palmer plate of the deformed finger, postoperatively all swan-neck deformities were corrected and functional improvement was noticed. (10)

We used the K-wire to ensure and maintain optimal position of the finger postoperatively, this can be replaced by proper splintage and careful post-operative physiotherapy it depends largely on patient factors. The choice can affect the post-operative results.

The complications encountered were expected with the use of the K-wire that is a potentially infected or contaminated procedure with injury to the joint surface that increased the possibility of joint stiffness.

Further studies with larger sample and longer period of follow up may give better and more accurate results about this new procedure that can be regarded as a modified Tonkin technique (10).

will be gained. For mallet and secondary swan-neck deformity another successful operative choice for correction of both deformities is Littlers operation (SORL). (8)

The Beckenbaugh tenodesis of one slip of the sublimins proximally to the A2 pulley is a simple well known and useful procedure, its widely used in practice but its rather static and less dynamic procedure than our transfer surgery, it never allows PIP extension in any position although powerful active flexion is maintained depending on the integrity of the FDS. Maintained flexion may lead to permanent stiffness in this position that may increase to more than 30 degrees of flexion that impairs flat hand position (fig.4). (1)

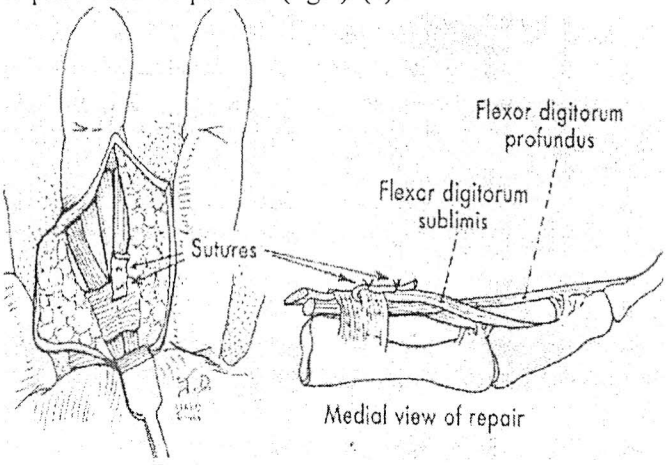

Figure 4 Beckenbaugh procedure (1)

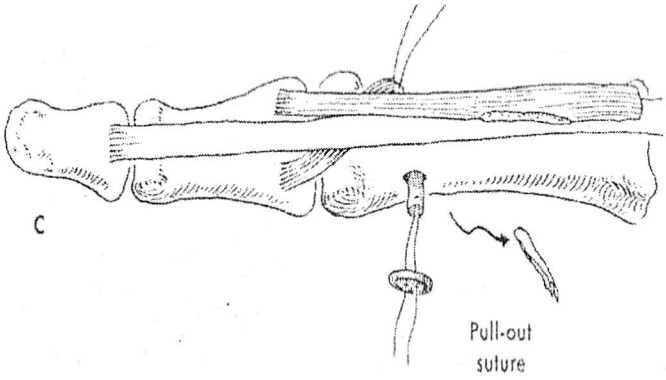

Figure 5 the Curtis tenodesis (1)

References:

1. *A.H. Grenshaw: Campbell's Operative Orthopaedics, 7th ed., St.Louis, 1987,Mosby, P. 381, 386,157, 383, 382, 374, 280.*
2. *R.J. Last: Anatomy Regional And Applied, 7th ed., Edinburgh, 1984, Churchill Livingstone, P. 101, 103.*
3. *Gregory S. Georgiade et al: Georgiade Plastic, Maxillofacial and Reconstructive Surgery, 3rd ed., Baltimore, 1997, Williams & Wilkins, chapter 92 p. 1000-1009, 1035.*
4. *Graham Lister: The Hand: diagnosis and indications, 2nd ed., Edinburgh, 1984, Churchill Livingstone, Chapter 5 P.250.*
5. *Foucher et al: Treatment of Post-Traumatic Swan-neck Deformity of the Fingers, apropos of a series of 43 patients, Rev-Chir-Orthop-Reparatrice-Appar-Mot. 1992; 78 (8): 505-11.*
6. *Nalebuff-EA: The Rheumatoid Swan-neck Deformity, Hand-Clin. 1989 May; 5 (2): 203-14.*
7. *Brandsma-JW et al: Flexor Digitorum Superficialis Tendon Transfer For Intrinsic Replacement. Long-term Results and The Effect on Donor fingers, J-Hand-Surgery-Br. 1992 Dec; 17 (6): 625-8.*
8. *Girot-J et al: Littler's Operation (SORL) in The Treatment of Swan-neck, Ann-Chir-Main. 1988; 7(1): 85-9.*
9. *Curtis R.M.: Treatment of Injuries of Proximal Interphalangeal Joints of Fingers, In Adams, J.P., editor: current practice in orthopaedic surgery, vol. 2, St. Louis, 1964, the C.V. Mosby Co.*
10. *Tonken-MA et al: Lateral Band Translocation For Swan-neck Deformity, J-Hand-surgery- Am. 1992 Mar; 17 (2): 260-7.*