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Osteophyte-sparing Treatment of Mucous Cysts: Case Analysis and Surgical Technique

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Disclaimers

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of Defense or the US Government.

This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki and was carried out in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act (HIPAA).

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Abstract

Objective

The purpose of this study is to examine patient outcomes and the risk of recurrence of mucous cysts affecting the distal interphalangeal joint in the absence of osteophytectomy using the described flap technique.

Methods

Retrospective review of 143 records of patients undergoing treatment for mucous cysts of the distal interphalangeal joint performed by a single surgeon. Inclusion criteria included the absence of an osteophytectomy during treatment using the described dorsally-based flap technique and a minimum of 12 months of follow-up.

Results

One-hundred-forty-three mucous cysts affecting the distal interphalangeal joint of 131 patients with an average age of 65.3 years were included. The average follow-up was 21.9 months (12 to 139). Postoperative distal interphalangeal joint extension was less in the operative digit compared to the contralateral comparison with a significant change from preoperative motion

(1.5º vs 0.3º; p = <0.05). There was not a significant change in postoperative flexion of the distal interphalangeal joint compared to the contralateral side (-1.4º vs -0.9º; p = 0.57). Recurrence occurred in 2 patients (1.4%). No infections or wound complications were identified.

Conclusions

Using the described technique without an osteophytectomy is an effective treatment for mucous cysts originating from the distal interphalangeal joint.

Level of Evidence

Therapeutic Level IV

Introduction

Cysts affecting the distal interphalangeal joint were first described by Hyde in 1883 as "synovial lesions of the skin" and are known today by a variety of names including myxomatous degeneration cysts, recurring myxomatous cutaneous cysts, and mucous cysts.[1–3] Mucous cysts of the distal interphalangeal (DIP) joint are similar to other ganglion cysts in that they have a connecting stalk that communicates with the nearby joint. These are common lesions associated with degenerative changes and typically occur in middle age and late adulthood. They commonly arise through the interval between the collateral ligament and extensor mechanism, but will occasionally arise simultaneously on both sides of the tendon (i.e., extensor mechanism) or rarely through the ligament or tendon (Figures 1 & 2).

Despite the almost universal acceptance of the need for an osteophytectomy when treating these lesions, some authors have noted low recurrence rates when treating ganglion cysts with techniques that do not include boney debridement. The purpose of this article is to examine the patient outcomes and risk of recurrence using the described technique which excludes boney debridement and is based on the experience of the senior author (TRS).

Materials and Methods

After Investigational Review Board (IRB) approval, 514 records of patients who had undergone mucous cystectomy by a single surgeon were examined. Cases were excluded if patients had undergone an osteophytectomy, if the record was incomplete, or if a minimum of 12 months of follow-up was not achieved. All surgical excisions and postoperative exams were performed by the original surgeon (TRS). Operative records were searched and noted for which patients had

undergone mucous cystectomies performed using the described technique while sparing the osteophyte. The medical records were used to collect the following data: age, sex, laterality, digit involved, presence of nail deformity, recurrence, complications, need for repeat procedures, and range of motion. Of note, if hyperextension of the joint was present, DIP joint extension was recorded as 0º in the original record.

Categorical data was summarized using percentages. Means and standard deviations were used for summary statistics of continuous variables. Changes in Preoperative and postoperative active ROM flexion and extension of the DIP were also analyzed using paired t-test. Significance for results was established when p-values were less than 0.05. All statistical analysis was performed using JMP v13.2 SAS Corp (Cary, NC).

Surgical Technique

Anesthesia is achieved with a digital block and hemostasis is maintained with a tourniquet. A flap is planned with the lesion at the flap's base (Figures 3). Proximally, the incision is planned dorsal to the mid-axis line to preserve as much blood supply to the flap as possible and prevent tip-necrosis. The absolute extent of the flap is from mid-axis to mid-axis, although this is rarely needed. The flap is made long enough to extend to the opposite side of the extensor mechanism so that the interval between the extensor mechanism and the collateral ligament can be explored on each side. This allows access to the joint on both the radial and ulnar sides of the extensor tendon to reliably identify the location of cyst emanation. The same incision can also be used to treat a mucous cyst that recurs on the opposite side of the extensor tendon. The plane of the flap is found proximal to the distal extension crease by blunt dissection with scissors and remains

superficial to the lateral bands as dissection is carried distally. Care is taken not to dissect beyond the volar mid-axis as this is not necessary and can put the skin flap at risk for necrosis. Though it can be released without consequence, identification and preservation of Cleland's ligament at the base of the flap can help the surgeon avoid excessive volar dissection toward the neurovascular bundle. The distal portion of the flap lying between the distal extensor crease and the distal eponychial edge of the skin has no dissection plane and the surgical plane must be created with a scalpel taking care to not enter the germinal matrix of the nail plate.

The capsulotomy is started by disconnecting the cyst from the stalk. A longitudinal incision is made along the edge of the extensor mechanism at the level of the DIP joint. This is performed by orienting the blade parallel and adjacent to the metaphysis of the middle phalanx, skiving the knife along the side of the distal condyle, thereby partially or completely detaching the proximal portion of the collateral ligament and leaving it in situ. The collateral ligament is then partially released distally from the base of the distal phalanx taking care not to enter the germinal matrix. The collateral ligament along with its adjacent joint capsule is kept in the base of the flap. No portion of the collateral ligament is excised but left in-situ in the base of the flap to allow for reattachment through scar formation. The released collateral ligament is retracted with a skin hook and a dental probe is passed around the condyle of the middle phalanx to ensure release of this proximal attachment and capsule (figures 4A, 4B & 5). Care must be taken to avoid complete release of the proximal portion of the collateral ligament when operating on the ulnar side of the thumb or the radial side of the index finger to ensure no instability during pinch is created. In these cases, the volar one-third of the collateral ligament is left intact. The cyst itself is not excised from the flap to avoid risking the flap's integrity. The wound is then closed in a standard fashion and a dressing is applied. Resumption of

motion is started one week postoperatively. Sutures are removed fourteen days postoperatively.

Results

One-hundred-forty-three mucous cysts affecting the distal interphalangeal joint of 131 patients (82 female and 49 male) with an average age of 65.3 years (range 41-90) were included in the analysis (Table 1). There was an average follow-up of 21.9 months (range 12.0-139.0). The left hand was involved in 57 cases (39.9%) and the right hand was involved in 86 cases (60.1%). Recurrence occurred in two patients (1.4%). Preoperative nail deformities such as grooving or linear flattening were present in 58 of the 143 (40.6%) cases, which resolved in 55 (94.8%) cases. No complications or complaints of instability were reported.

Preoperative and postoperative active ROM of the DIP was compared to the same digit of the contralateral hand. In addition, the change in preoperative and postoperative motion were compared (Table 2). The average preoperative ROM of the operative digit of the DIP joint was from 1.3º (0º to 23º) to 67.6º (37º to 92º) of flexion. The average preoperative ROM of the contralateral comparison digit for the DIP joint was from 1.2º (0º to 33º) to 69.9º (38º to 90º) of flexion. There was not a statistically significant difference in preoperative extension of the operative digit compared to the contralateral digit (1.3º vs 1.2º; $p = 0.854$). Preoperative flexion was significantly less in the operative digits compared to the contralateral digit (67.6º vs 69.9º; $p = <0.050$).

The average postoperative ROM of the operative digit for the DIP joint was from 2.8º (0º to 27º) to 66.3º (37º to 86º) of flexion. The average postoperative ROM of the contralateral comparison

digit was from 1.5º (0º to 20.0º) to 69.0º (38º to 86º) of flexion. Postoperative extension was significantly less in the operative digit (2.8º vs 1.5º; p = <0.050). Postoperative flexion remained significantly less in the operative digits (66.3º vs 69.0º; p = <0.050). The change in pre- and postoperative extension was significantly more in the operative digit (1.5º vs 0.3º; p = <0.050) On average both the operative and contralateral digit lost flexion. However, there was not a significant change in flexion of the operative side compared to the contralateral digit (-1.4º vs -0.9º; p = 0.572).

Discussion

Mucous cysts of the distal interphalangeal joint are challenging to treat. Their high rate of recurrence has led to the development of various therapies and surgical techniques. Described treatments include repeated needle punctures, cauterization, steroid injection, proteolytic injection, radical amputation, irradiation, skin grafting, flap coverage, dissection with an osteophytectomy, and dorsal capsulectomy.[4–8] Needle aspiration with or without injection with local anesthetic and steroid have recurrence rates ranging from 40% to 100% while simple excision recurrence has been reported to range from 25% to 28%.[5,9–12] Clinical studies have shown much lower recurrence rates when osteophytes are removed. Eaton et al.[4] reported 1 recurrence in 50 cases (2%), Kleinert et al.[6] reported no recurrence in 36 cases, and Rizzo et al.[10] reported no recurrences in 54 patients with their respective techniques, all three emphasizing an osteophytectomy.

The importance of performing an osteophytectomy has been emphasized in techniques with high rates of success.[4,6,10,13,14] However, as Kanaya et al.[7] noted that excision of the osteophyte requires disruption of the dorsal joint capsule. Despite the similarity in pathogenesis with wrist ganglion

cysts, capsular debridement, not boney debridement, is an effective treatment for ganglion cysts of the wrist.[15] The results of this paper suggest this is also true for mucous cysts of the DIP joint and that debridement of the stalk's emanation by the wide opening of the joint capsule results in scar formation that seals the pathologic area of the capsule. This studies findings support the conclusion by Kanaya et al.[7], that boney debridement is not a critical step to achieve a low rate of recurrence.

The recurrence rate of 1.4% (2/143) is comparable to the 2% (1/50) rate reported by Eaton et al.[4] in their 1973 article that concluded osteophytectomy is required to prevent recurrence. Although the cause for recurrence in this study is difficult to elucidate, one of the two cases had documentation of the cyst arising simultaneously on both sides of the extensor mechanism. Therefore, this recurrence may be explained by inadequate capsulotomy. Despite these two recurrences, the final recurrence rate of less than 1.5% may be acceptable and comparable to other techniques.

Although the described technique can include an osteophytectomy if the surgeon chooses, avoiding osteophyte excision can be advantageous. Performing an osteophytectomy risks inadvertent debridement of the germinal matrix, which can lead to a new or persistent nail deformity. In cases of infection, which occurred in 2.3% of cases in one study[16], the same exposure can be utilized for joint debridement or to prepare the joint for arthrodesis and the flap can be left open to allow the joint to drain.

Joint stiffness and diminished DIP joint ROM have been reported following cyst excision and it has been suggested these changes are worsened after osteophyte debridement.[7,14,16,17] In this study, preoperative flexion was less in the operative digit compared to the contralateral side and remained significantly less at the last follow-up. There was also a significant loss of extension compared to the contralateral side. However, the differences in flexion and extension pre- and postoperatively are small (i.e., average ≤1.5º). Ultimately, these findings are relevant as they suggest that the described technique is unlikely to lead to a clinically significant loss of motion.

Limitations to this study include the lack of randomization; no reported postoperative pain scores; and all procedures being performed by the same surgeon, which may limit external validity and create bias. The strengths of this study include a large number of cases; postoperative exams and ROM measurements performed by the original surgeon; and the long follow-up times with range of motion data (average 21.9 months).

This study supports the use of the described flap technique with osteophyte sparing for the definitive treatment of mucous cysts affecting the distal interphalangeal joint.

Acknowledgements

None

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Figure Legends

Figure 1: Illustration demonstrating a the cyst originating from the area between the extensor mechanism and collateral ligament.

Figure 2 Illustration demonstrating a "dumbbell" cyst arising from both sides of the extensor mechanism and between each collateral ligament.

Figure 3 Illustration demonstrating the planned surgical incision dorsal to the mid-axis with the cyst located at the base of the flap.

Figures 4A & 4B Illustration and intraoperative photograph demonstrating exposure obtained by exposing the interval between the extensor mechanism and the collateral ligament.

Figure 5 Illustration demonstrating a dental probe being used to ensure joint exposure with partial or complete takedown and reflection of the proximal portion of the collateral ligament and adjacent joint capsule.

Table Legends

Table 1: Patient demographics.

Table 2: Range of motion comparison between the operative digit and contralateral comparison. DIP: distal interphalangeal joint.

Tables

Table 1

Sex	Laterality	Digit	Recurrence
Female = 90 (62.9%)	Left = 57 (39.9%)	1st = 29 (20.3%)	
		2nd = 38 (26.6%)	
Male = 53 (37.1%)	Right = 86 (60.1%)	3rd = 60 (42.0%)	2 (1.4%)
		4th = 7 (4.9%)	
		5th = 9 (6.3%)	

Table 2

	Operative Digit	**Contralateral Comparison**	**p-value**
Preoperative DIP Extension	1.3º ± 4.2º	1.2 ± 4.5º	0.854
Preoperative DIP Flexion	67.6º ± 9.2º	69.9º ± 9.3º	<0.050
Postoperative DIP Extension	2.8º ± 5.9º	1.5º ± 4.3º	<0.050
Postoperative DIP Flexion	66.3º ± 9.8º	69.0º ± 9.2º	<0.050
Change in DIP Extension	1.5º ± 4.9º	0.3º ± 3.1º	<0.050
Change in DIP Flexion	-1.4º ± 7.4º	-0.9º ± 7.3º	0.572

Figures

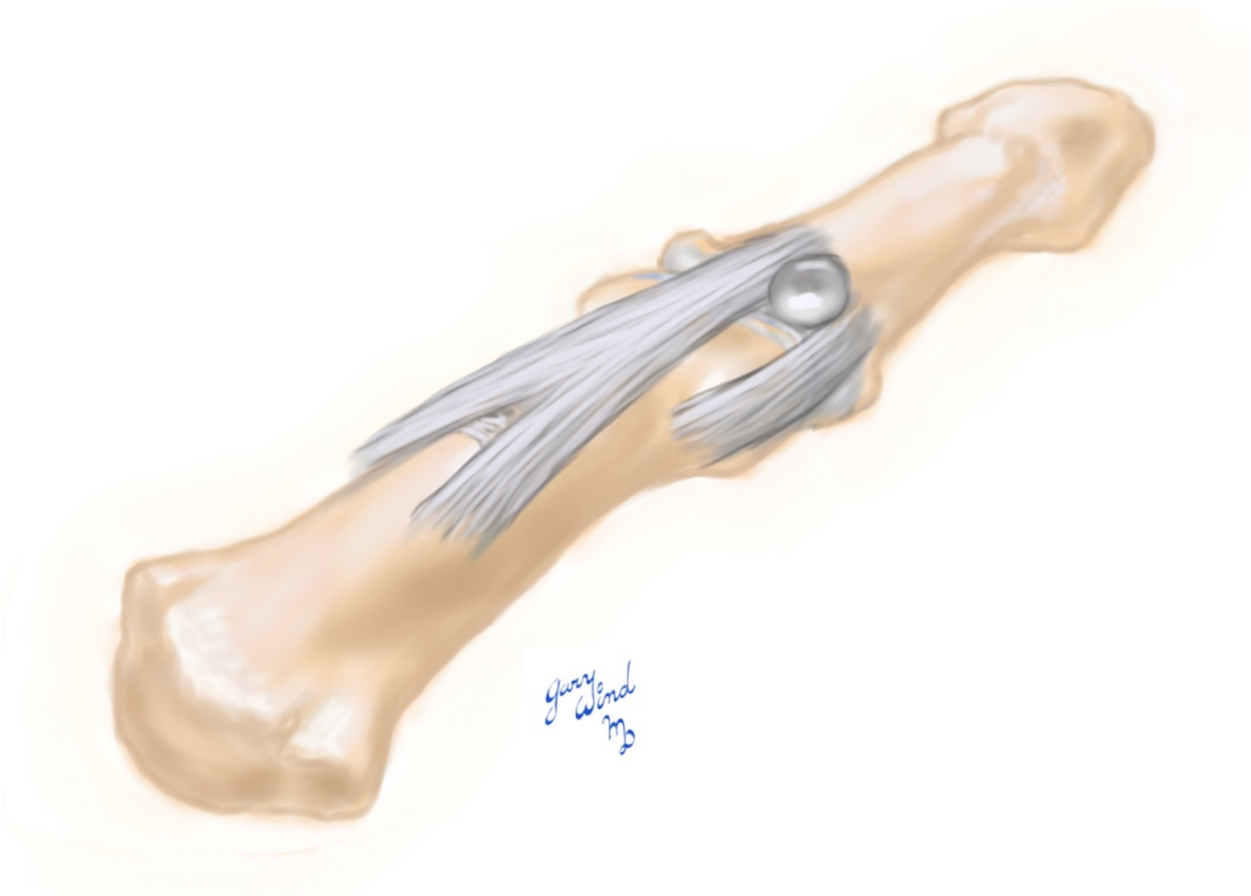


Figure 1

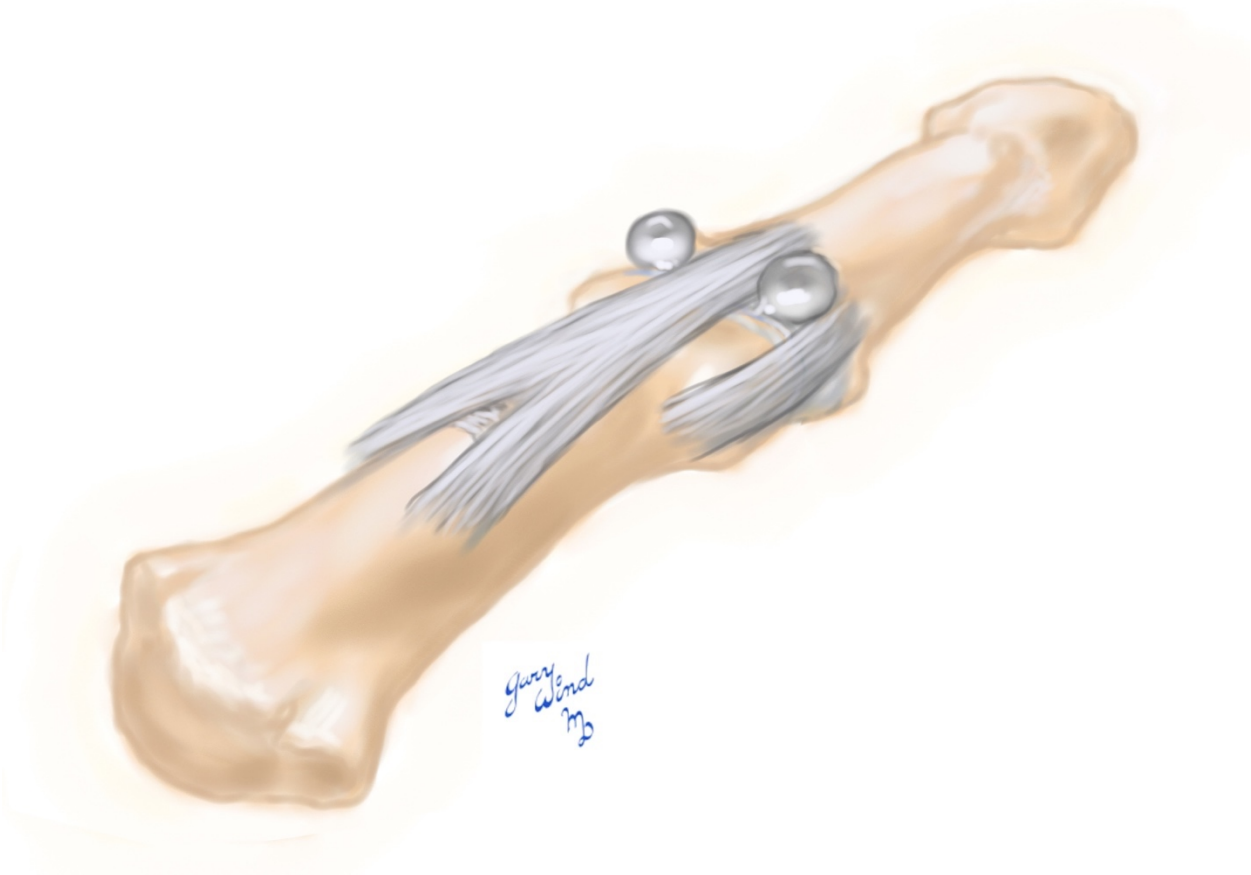
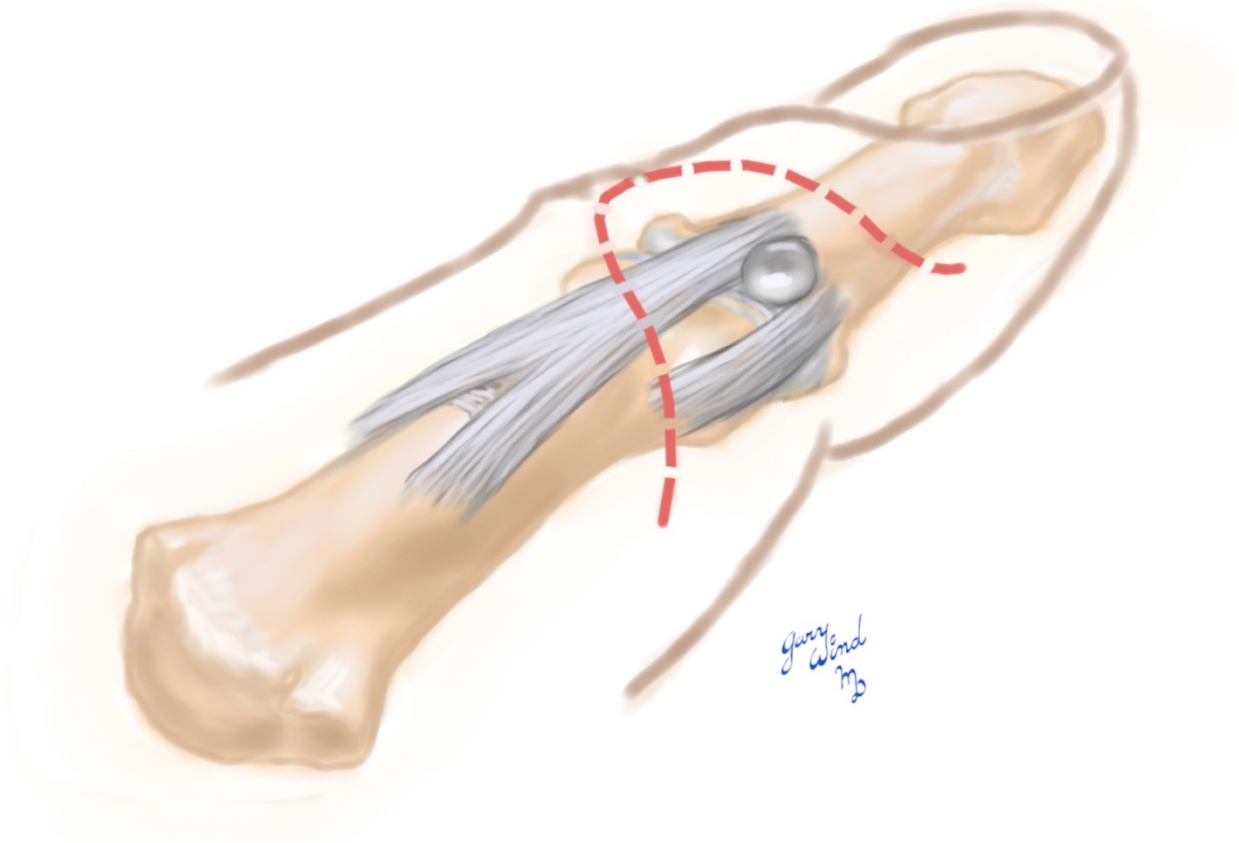


Figure 2



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354 *Figure 3*

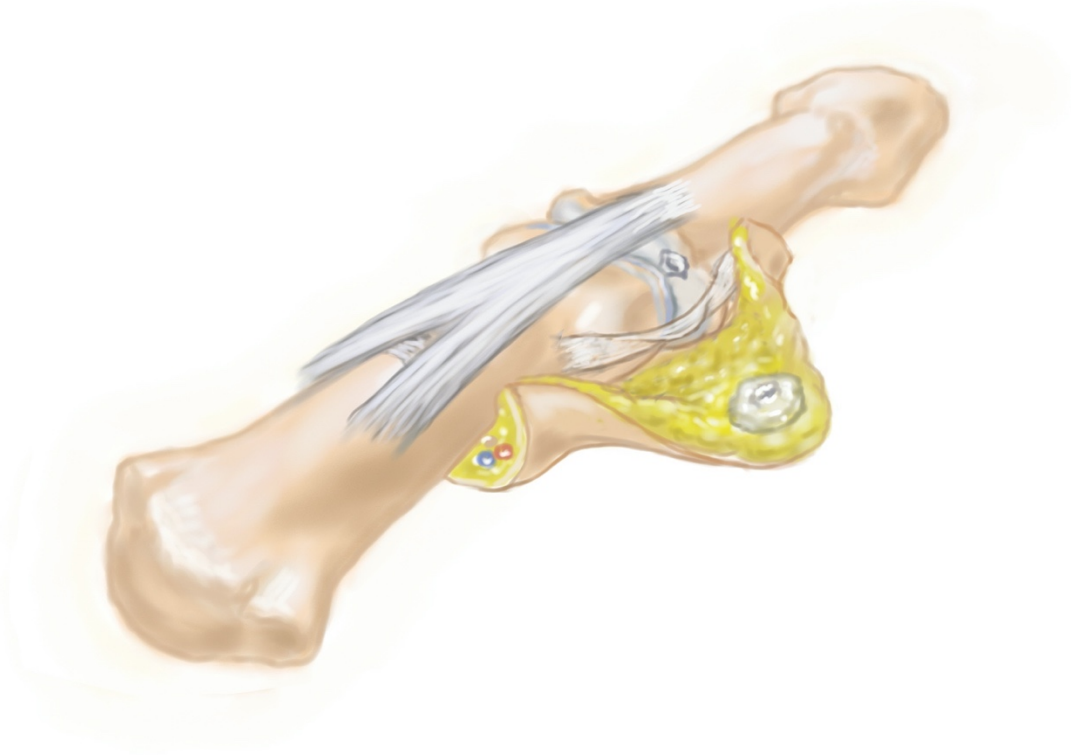


Figure 4A

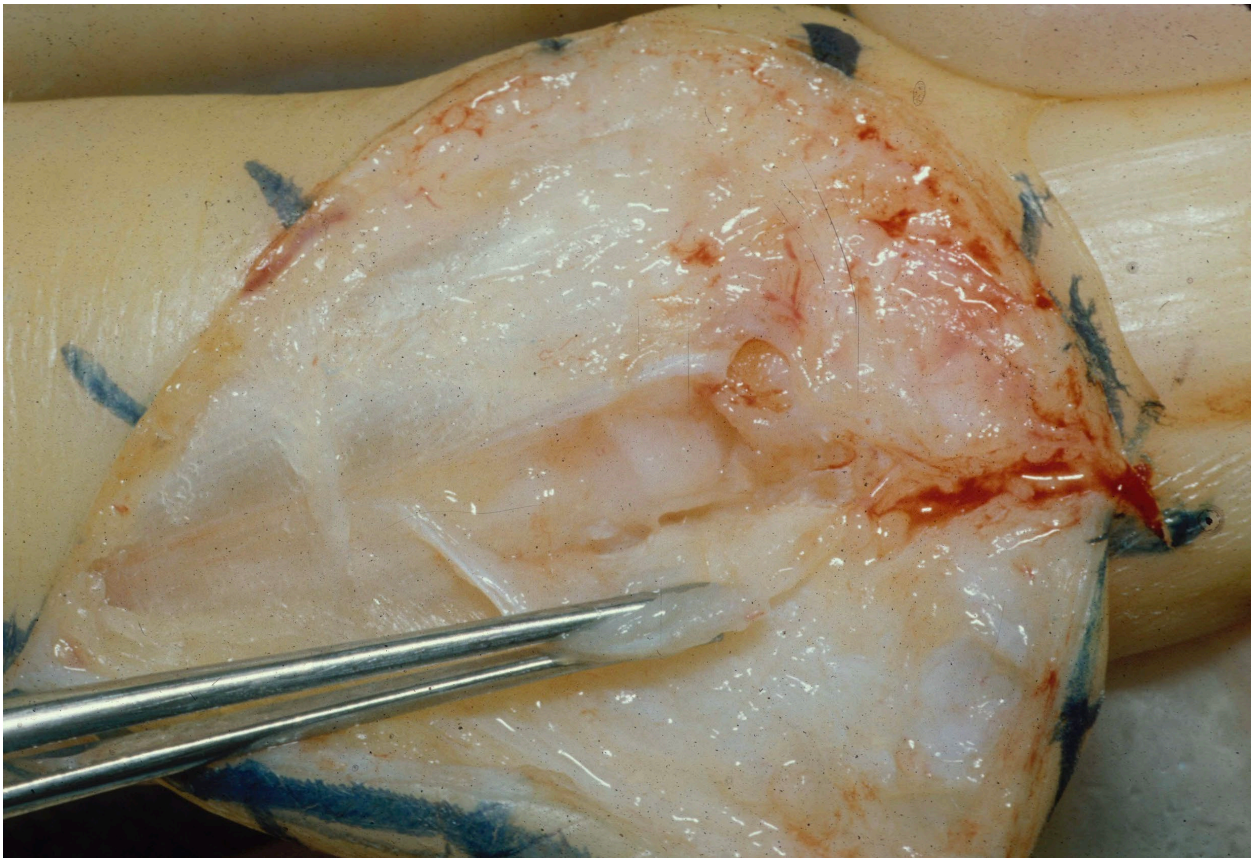
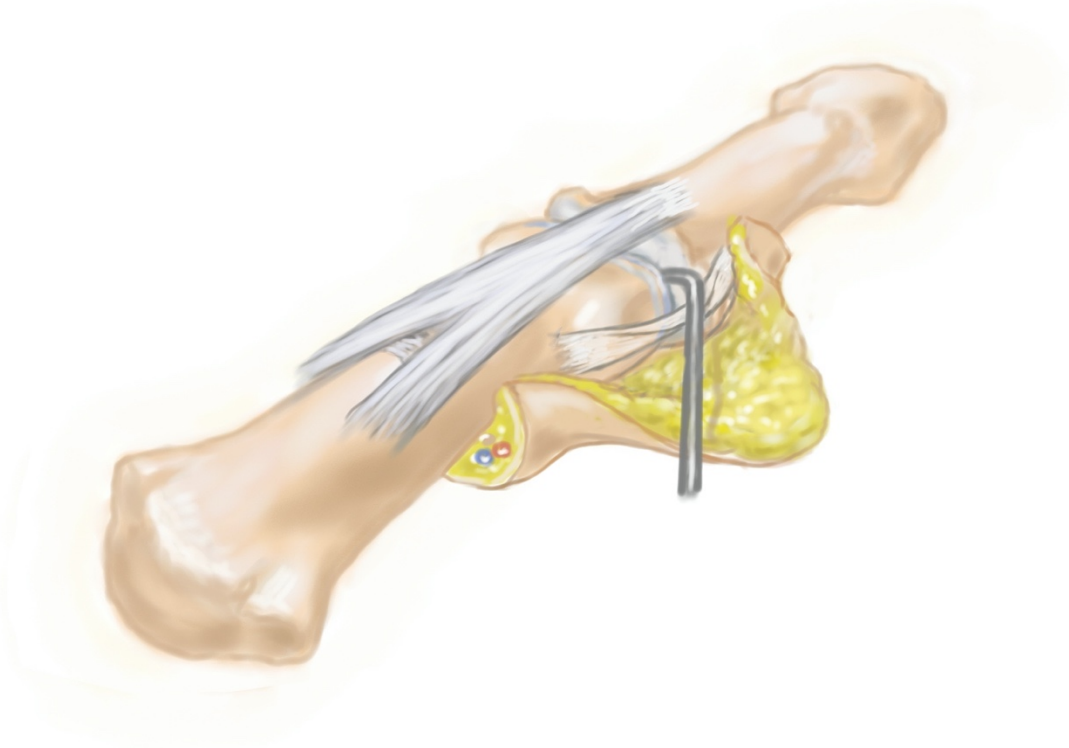


Figure 4B



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362 *Figure 5*

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