Ganglion of the Distal Interphalangeal Joint (Myxoid Cyst)

Therapy by Identification and Repair of the Leak of Joint Fluid

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**Background:** Digital myxoid cysts are a relatively common pathology in the skin, representing a ganglion of the adjacent distal interphalangeal joint. Success of treatment is largely proportional to the destructiveness of the therapy and postoperative morbidity. We studied an effective, minimally traumatic surgical treatment in which tissue is not removed and morbidity is low.

**Design:** Open, nonrandomized trial of therapy. Methylene blue dye was injected into the distal interphalangeal joint. A skin flap was designed around the cyst and raised to identify the dye-filled communication between joint and cyst. The communication was sutured and the flap was replaced with no tissue excision.

**Setting:** Two university dermatology departments.

**Patients:** Fifty-four subjects with 47 cysts involving fingers or thumbs and 7 involving toes. Previous therapies in 37 patients had resulted in relapse.

**Main Outcome Measures:** Clinical assessment at 2 and 8 months.

**Results:** We treated 34 women and 20 men (mean age, 60.4 years; range, 45-83 years). Communication between cyst and joint was identified by means of methylene blue injection in 48 patients (89%). At 8 months, 48 patients remained cured with no visible scarring. Of these, nail dystrophy associated with the cyst preoperatively (n=35) resolved in all but 1 patient (97%). Six patients had relapses (5 within 4 months). Of these, 3 were on the toes. Cure rate on toes was 4 of 7 (57%) and on fingers, 44 of 47 (94%). In 2 patients, pain persisted for 4 months and then resolved. Limitation of joint mobility resolved after 2 months in 1 subject.

**Conclusions:** Ligature of myxoid cyst origin at the joint capsule is an effective treatment and does not require excision. Myxoid cysts on toes are more likely to relapse than those on fingers.

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**RESULTS**

We believe that digital myxoid cysts (DMCs) arise as a result of joint fluid leaking from a degenerative distal interphalangeal joint (DIPJ), and that the pathology can be cured by sealing the point of leakage. We tested this theory by investigating therapy that confirms the presence or absence of a connection between the DIPJ and the overlying DMC by injecting dye into the joint and watching for the dye to appear in the cyst. We then divided or destroyed the connection between the cyst and the joint by means of suture ligature or electrodesication. The cyst was left intact and no skin was excised.

Ninety-four subjects were seen with DMC. Thirty-four women and 20 men with a mean age of 60.4 years (range, 45-83 years) chose surgery. Of these, 37 (69%) had undergone previous cryosurgery followed by relapse. The DMCs involved fingers or thumbs in 47 patients and toes in 7. All DMCs arose in the skin between the DIPJ and the cuticle. Fifteen DMCs were located so deep as to require reflection of the proximal nail fold to gain access (Figure 3). In all of these patients, the cyst was above the nail plate and did not extend into the nail bed or pulp.

Communication between DMC and DIPJ was identified by means of methylene blue injection in 48 (89%) of 54 patients. Of the remaining 6 patients, dye was still found in adjacent tissues in 3 patients. In the remaining 3 patients, it was assumed that dye failed to enter the joint. There was no clear relationship between the anatomical state of the joint and detection of communication by means of methylene blue dye.

Healing occurred rapidly. After suture removal, the flaps were intact, al-
PATIENTS AND METHODS

We undertook a prospective study of 54 adults presenting to 2 teaching hospital dermatology departments between March 1, 1995, and December 31, 1998. The therapy was offered as an alternative to cryosurgery, making patient preference the basis for selection in most instances. Where access to the cyst required reflection of the proximal nail fold, surgery was considered the only option. Preoperative radiography was not routinely performed. The technique of DIPJ injection was first practiced on the fingers of cadavers. All surgery was performed under local anesthetic ring block of digital nerves at the base of the digit using 2% plain lidocaine hydrochloride. Methylene blue (0.1 mL) was injected into the DIPJ using a 1-mL syringe with a 32-gauge needle via the palmar surface while holding the digit in 20° of flexion (Figure 1). The needle puncture was made at a point 2 to 3 mm proximal to the volar crease of the DIPJ, holding the syringe at approximately 45°. Almost immediately after successful joint injection, blue dye appeared in the cyst (Figure 2). An exsanguinating tourniquet was then applied.

An incision was made starting at the distal margin of the dye-filled cyst, and a proximally based skin flap was dissected. This technique was modified where necessary to reveal the underlying subcutaneous tissues containing the methylene-stained pedicle between the cyst and the DIPJ. When the cyst arose immediately adjacent to the cuticle, the entire nail fold was fashioned as a flap, with 2 oblique incisions taken proximally from the lateral nail folds. Beneath the flap, a dye-filled line could be traced from the DMC to the DIPJ. When this was identified, it was tied with 5/0 catgut or polyglactin 910 suture (Vicryl; Ethicon, Inc, Somerville, NJ). During the course of this procedure, the cyst contents were evacuated but no skin was excised, and the cyst roof was left intact. At the end of the procedure, the skin flap was sutured back into place.

If no dye entered the joint, a flap was raised between the cyst and the joint, the area between the cyst and the joint was gently electrodesiccated, or a purse-string suture was used, and the skin flap was resited. A firm dressing was placed over the wound and an antibiotic ointment (mupirocin) was applied. Dressings were left for 2 to 5 days. Subjects were warned that the injected blue dye would discolor nearby skin for 1 to 2 weeks before clearing completely. Surface sutures were removed at 5 to 7 days, and a simple dressing was applied for an additional week. Patients were advised to avoid heavy manual work for 2 weeks postoperatively and were followed up at 2 and 8 months after surgery to establish outcome. The main outcome measure was cure of the DMC, with additional note of nail dystrophy, pain, and limitation of joint movement.

Comment

The cause of DMCs is controversial. Histologically, DMCs do not have an epithelial lining.1 One series reports the presence of a mesothelial lining in the channel between the abnormality and the adjacent joint,2 but the term cyst, although commonly accepted, is a misnomer. Some investigators have demonstrated a communication between the DMC and the DIPJ and argue that the condition develops as a result of a communication with the DIPJ.3-6 Others believe that the cysts are degenerative in origin and unrelated to the adjacent joint.7 We believe that a DMC is a ganglion and have demonstrated that there is a connection between the DMC and the DIPJ in almost 90% of cases.

A wide range of treatments has been reported. Simple puncture and drainage had a reported success rate of 72% when 40 patients were given a median of 2 to 5 treatments during a 5-year study with no defined follow-up period.8 The potential for infection of the DIPJ is controversial. Cryosurgery of the cyst results in cure rates though in some instances the DMCs became crusted and sloughed off during the next 10 to 14 days. Postoperative pain required only acetaminophen in most cases.

Analgesia was mainly needed for those lesions located beneath the proximal nail fold, in which the postoperative course was associated with inflammation and swelling of the overlying nail fold. In 2 instances, tenderness persisted for 4 months and then settled. In 1 subject, there was limitation of joint mobility that resolved after 2 months.

At 8 months, 48 (89%) of 54 patients remained cured. Outcomes differed between fingers and toes; the cure rate on fingers was 44 (94%) of 47, compared with 4 (57%) of 7 on toes. When recurrences were examined in relation to location within the digit, those located deep within the nail fold tissues that required reflection of the proximal nail fold (15/54 [28%]) had a higher success rate (14/15 [93%]), than those occurring more superficially (34/39 [87%]) (Table).

In the 6 patients in whom direct communication with the joint was not demonstrated using dye, success was still seen with a combination of purse-string suture and light electrodesiccation beneath the DMC.

At 8 months, there was no joint limitation, tenderness, visible scarring, or nail dystrophy associated with surgery. A longitudinal groove in the nail was present preoperatively in 35 patients (73%) and resolved in all but 1 subject. Preoperative joint symptoms remained in those with manifest osteoarthritis.

Figure 1. Technique for injecting dye demonstrated on a cadaver finger.

Figure 2. Technique for injecting dye demonstrated on a cadaver finger.
of 56% to 86%. Surgical excision of the cyst has reported success rates of 88% to 100%. In all instances, the presence of a communication was sought, and in one series, intra-articular methylene blue injection was used to aid this process. Large osteophytes were removed in all series, and in 1 series, removal of all osteophytes was central to the technique. However, the morbidity associated with surgery and cryosurgery at this site can be high. Restriction of joint mobility, nail dystrophy, and changes to the contour of the proximal nail fold are potential drawbacks.

In 6 of our patients, dye may have not entered the DMC for any of the following 3 reasons: the operator failed to inject dye into the joint; communication between DMC and DIPJ may have closed at some stage in the evolution of the DMC; or the DMC may have developed without a communication with the DIPJ.

The abnormal features of an arthritic joint include roughening of the articular surfaces, with osteophyte formation and increase of synovial fluid associated with inflammation. Both of these are likely to contribute to the formation of DMCs. The changes in articular surface might abrade and damage the joint capsule, with flaws opening at points of weakness. The escape of fluid through these flaws will be increased where there is a rise of intracapsular pressure associated with inflammation and effusion. The fluid will then escape to accumulate at a site of least resistance, which can be at one of many locations in relation to the DIPJ.

Such a model of DMC formation explains why there is no formal epithelial lining to the cyst. It also explains why DMCs are prone to relapse if the whole capsule and joint are diseased, and channels of communication between cyst and joint may be multiple, as demonstrated on magnetic resonance imaging findings.

In our opinion, DMCs are synonymous with ganglia at other sites. Both abnormalities lack an epithelial lining and have a demonstrable communication with the adjacent joint. de Villiers et al proposed a valvular function preventing flow backward from ganglion to
wrist. They demonstrated this by attempting retrograde wrist arthrography via the ganglion and contrasted the findings with those of ganglionography via the wrist joint.14

This principle might explain why the toe joint is more difficult to treat successfully than a finger joint, leading to a success rate of only 57% in the former. In the toe, the pressure of fluid escaping from the joint will be increased by the weight of the standing individual being directed downward when walking.

Many treatments use nonspecific trauma,8,10,15,16 removal of osteophytes,17 or anti-inflammatory effects of steroid.18,19 All of these fit our model of DMC pathogenesis. Nonspecific trauma will provoke fibrosis, which may block a hole in the joint capsule. Osteophyte surgery may remove the physical cause of capsular damage, and steroid injection may reduce the pressure for creation of a DMC. However, the therapies that most specifically address the communication with the DIPJ are the most successful.3,6 Osteophyte surgery as monotherapy can be effective, but it can lead to a stiff joint or extension lag as a complication in nearly 25% of cases, sometimes progressing to swan-neck deformity.17 These complications may reflect greater underlying joint disease, requiring more extensive surgery. Early mobilization is also thought to be helpful in preventing postoperative stiffness.

When we failed to demonstrate a communication between DIPJ and DMC in 6 patients, we used a purse-string absorbable suture beneath the DMC and light electrodesiccation. This therapy resulted in cure in those cases. This might mean that the treatment does not require visualization of the communication, or alternatively, that in those 6 patients the communication had recently involuted and that little therapy was needed to bring about cure.

CONCLUSIONS

A conservative surgical method that does not require tissue excision can be used to treat DMCs. It has a high success rate in fingers. Although other reports confirm the value of identifying the pedicle communication between the DMC and DIPJ, they have all used excision biopsy techniques. Eight months is a limited follow-up period; however, relapse usually occurred early, with 5 (83%) of 6 patients presenting within the first 4 months. Only 1 patient was referred again 3 years after treatment with a DMC of the toe. Treatment of the pedicle alone produces good results without the morbidity associated with more involved surgical procedures.

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