



Excision with Temporary Interphalangeal Joint Pin Fixation for Toe Ganglion Cysts

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Background: Toe ganglion cysts are often symptomatic and recurrent. Communicating lesions between ganglion cysts and the interphalangeal joint (IPJ) or tendon sheath make it difficult to prevent a recurrence. Temporary restriction of the joint and tendon motion can facilitate surgical site healing. This study analyzed the clinical results of temporary pin fixation of the IPJ after toe ganglion cyst excision.

Methods: Sixteen patients with symptomatic toe ganglion cysts underwent surgical treatment. Excision alone was initially performed on 10 patients. Six patients underwent temporary pin fixation of the IPJ after ganglion cyst excision. Repeat excision with pin fixation was performed for recurrence in two patients after excision only. Clinical evaluations and postoperative complications were analyzed.

Results: Fourteen of 16 toe ganglion cysts were located near the IPJ. Two cysts not adjacent to the joint completely healed after excision alone. Seven of 14 cysts near the joint recurred after initial excision alone and required repeated reoperation. Eight cysts did not recur after excision with pin fixation, including 2 that recurred after excision alone.

Conclusions: Temporary IPJ pin fixation after excision for ganglion cysts can be effective for preventing the recurrence of ganglion cysts adjacent to toe IPJ.

Keywords: Toe joint, Neoplasm, Ganglion cyst, Recurrence, Bone wire

Ganglion cysts are thin-walled cystic lesions located in subcutaneous tissues, most commonly on the dorsal aspect of the wrist. About 11% of ganglion cysts occur on the foot and ankle, mostly overlying the ankle joint or the extensor tendon of the dorsal part of the foot.¹⁾ According to Ahn et al.,²⁾ 12% of ganglion cysts of the foot occur on the toes.³⁾ Toe ganglion cysts rarely occur, but cysts of the

toe cause pain due to shoe compression or pressure during walking. Furthermore, continuous discharge increases the risk of infection, thereby increasing the need for excision.⁴⁾

Lee et al.⁵⁾ reported that preventing hallux ganglion cyst recurrence is difficult because of the tendon sheath and intra-articular space communication in the form of a check valve in the hallux ganglion. Without adequate management of communicating lesions, there is a high probability of recurrence. For the complete resection of communicating lesions, Takahisa et al.⁶⁾ tried arthroscopic toe ganglionectomy with color-aided visualization of the ganglion stalk. If such cysts still recur, interphalangeal joint (IPJ) fusion can be a final option. Wang et al.⁴⁾ observed no recurrences after IPJ fusion performed for three recurrent intra-articular synovial cysts. Additionally, Kim et al.¹⁾ described a ganglion cyst with suspected IPJ com-

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munication that recurred four times but stopped recurring after IPJ fusion. However, joint fusion for the treatment of toe ganglion cysts should be carefully considered given the difficulty of small joint fusion and the permanent sacrifice of IPJ motion.

A more ideal treatment option would be a method for preventing recurrence after ganglion cyst excision that does not require IPJ fusion. This simple case series study analyzed the clinical results of temporary pin fixation of the IPJ after toe ganglion cyst excision.

METHODS

Approval from the Institutional Review Board of Asan Medical Center was obtained prior to commencing this retrospective study (No. 20211852). Informed consent was waived due to retrospective nature of this study. Sixteen patients, each with a single symptomatic toe ganglion cyst, who underwent surgical treatment between September 2014 and June 2020 were included in the study. Exclu-

sion criteria were patients treated with observation alone because of mild symptoms and patients who had comorbidities, such as diabetes, rheumatoid arthritis, and gout.⁷⁾ Twelve of the 16 patients underwent repeated manual rupture, aspiration, or excision but were not cured. Despite the risk of discharge-induced infection after repeated spontaneous cystic rupture, no patients had an infection at the time of their respective operations.

Two experienced foot and ankle orthopedic surgeons (HSL and YRC) operated on the 16 toe ganglion cysts at a single center. The recurrence rates for each surgeon were 50% (4 of 8 procedures) and 37% (3 of 8 procedures). There were no differences between the surgeons in terms of patient selection or surgical method. Ten of the patients initially underwent only ganglion cyst excision without any auxiliary procedures. Six patients underwent temporary pin fixation of the IPJ after ganglion cyst excision. Repeat excision with pin fixation was performed for 2 cysts that recurred after excision alone. Pin fixation was performed for 8 patients.

Operative Technique

After receiving digital nerve block anesthesia, patients underwent excisions in the supine position with a toe tourniquet applied. The operative approach varied according to the location of the ganglion. Complete cyst excision was performed. When temporary Kirschner wire (K-wire) fixation was performed, this was longitudinal K-wire fixation that included the nearest IPJ underlying the cyst. The K-wire diameter was 1.6 mm for the first toe and 1.1 mm for the lesser toes. Only 1 K-wire was inserted per procedure. The tip of the inserted K-wire was located outside of the skin (Figs. 1 and 2). The metatarsophalangeal joint was not fixed in any of the cases.

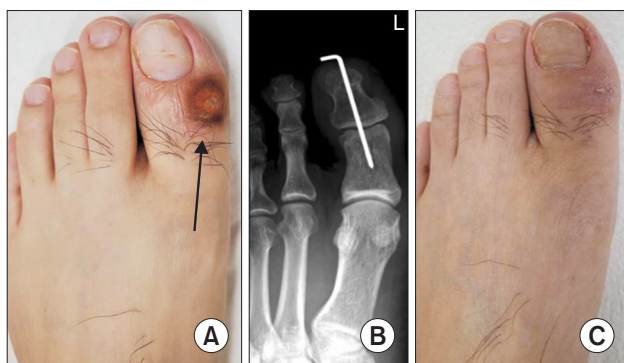


Fig. 1. (A) Recurrent ganglion cyst with discharge of the first toe after two previous excisions (black arrow). (B) Postoperative follow-up X-ray. (C) Healed without recurrence of ganglion at 15-month follow-up.

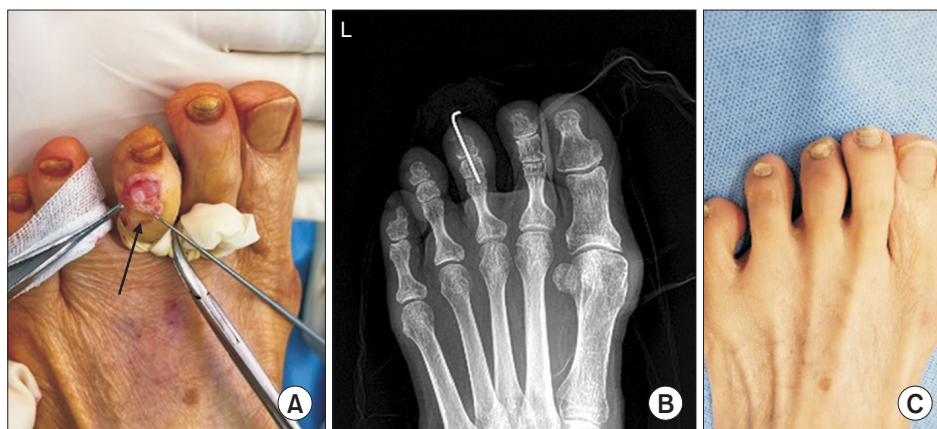


Fig. 2. (A) Ganglion cyst of the third toe adjacent to the distal interphalangeal joint (black arrow). (B) Postoperative X-ray. (C) Postoperative 1-year follow-up.

Postoperative Management

Full weight-bearing and ambulation were permitted with hard-sole shoes immediately after surgery. Sutures were removed after 2 weeks, and the pin was removed 4 weeks after surgery. After pin removal, active and passive dorsiflexion-plantarflexion exercises of the toe were started.

Statistical Analysis

Quantitative variables are reported as mean \pm standard deviation (range). All statistical analyses were performed using IBM SPSS Statistics for Windows ver. 21 (IBM Corp., Armonk, NY, USA), and *p*-values < 0.05 were considered statistically significant.

RESULTS

Of the 16 patients, 5 were women and 11 were men. The mean age of the patient group was 60.3 ± 10.7 years (range, 39–75 years), and all patients had difficulty wearing shoes because of painful cystic toe lesions. The mean follow-up period was 32.1 ± 36.3 months (range, 12–138 months) (Table 1).

The ganglion cyst was located adjacent to the IPJ of the toe in 14 of 16 cases (87.5%). Eight cysts were located on the first toe, 4 on the second toe, 3 on the third toe, and 1 on the fourth toe (Fig. 3). Seven cysts were on the IPJ of the first toe and the other 7 cases were on the distal IPJ joints (DIPJs) of the lesser toes. Two ganglion cysts not adjacent to the joint were completely healed after excision alone. Among the 14 joint-adjacent cysts, 8 underwent primary excision alone, and 6 patients underwent temporary pin fixation of the IPJ after primary ganglion cyst excision. There was a recurrence in 7 of the 8 ganglion

cysts that underwent primary excision alone (87.5%). Five of the 7 recurrent cysts underwent second excisions, and 1 of these did not recur, but third excisions were required for the other 4 second recurrences. Two of the 7 recurrent cysts were treated with pin fixation with no subsequent recurrence (Fig. 1). Six patients who underwent excision with pin fixation were treated without recurrence after 1 operation (Fig. 2). Eight patients, including 2 who experienced recurrence after primary excision alone, were cured without cyst recurrence after pin fixation. Many recurrences required repeated reoperations after excision only. Among the 7 initial recurrences after primary excision alone, 1 patient underwent repeat excision once, 2 underwent repeat excision twice, and 4 underwent repeat excision three times (Fig. 4).

Outcomes

In 1 patient, infection was accompanied by recurrence after excision only, but this resolved after debridement of the infected tissue. There were no instances of pin breakage or pin site infection among the 8 pin fixation cases.

Complications

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DISCUSSION

Fourteen of the 16 ganglion cysts (87.5%) in this study

Table 1. Patient Demographic Data

Variable	Total (N = 16)
Sex (male : female)	11 : 5
Age (yr)	60 ± 11 (39–75)
Location	
Dorsum	14
Medial	1
Lateral	1
Plantar	0
Mean follow-up period (mo)	32.1 ± 36.3 (12–138)

Values are presented as number or mean \pm standard deviation (range).



Fig. 3. Distribution of toe ganglion cysts.

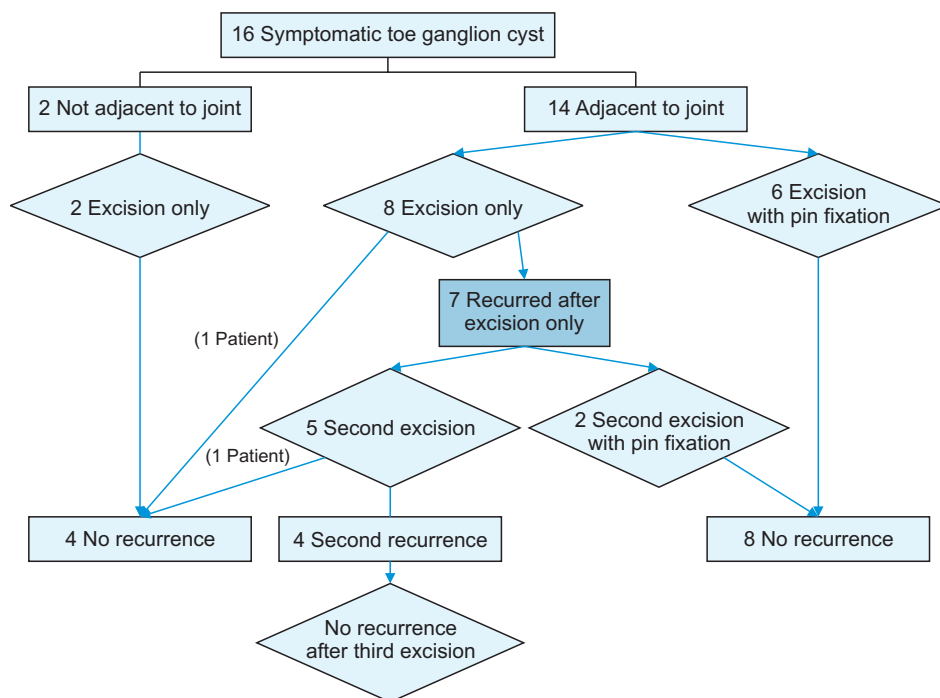


Fig. 4. Outcomes of each operation.



Fig. 5. (A) Spontaneously ruptured ganglion cyst of the first toe. (B) Preruptured ganglion cyst of the first toe before surgery.

were dorsally located. Characteristics of the dorsal foot, including the thin and soft skin relative to the plantar surface, cause cysts to be vulnerable to compression during ambulation. Associated pain or spontaneous cyst rupture may cause great discomfort (Fig. 5).

Nonsurgical treatment methods include aspiration, steroid injection after aspiration, and sclerotherapy. In general, recurrence is reported in 33% to 63% of ganglion cysts treated nonsurgically.⁷ Between 60% and 95% of ganglion cysts recur after aspiration, while up to 50% recur even after excision.⁸⁻¹⁰ Optimal surgical outcomes are associated with complete surgical resection, but complete resection does preclude recurrence.¹¹ Toe ganglion cysts can

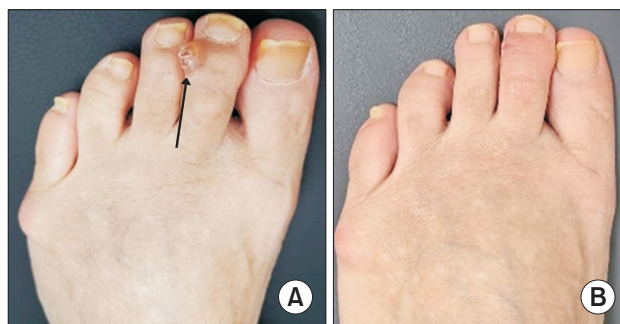


Fig. 6. (A) Ganglion cyst of the second toe adjacent to the distal interphalangeal joint (black arrow). (B) Postoperative 1-year follow-up.

recur not only in the context of insufficient excision but also when communicating lesions are not removed after the connections with the joint or tendon are not checked thoroughly.¹¹

Cysts are caused by mucoid degeneration of adjacent extra-articular connective tissue because of increased intra-articular pressure secondary to joint injury or repetitive trauma. Subsequently, communication occurs between the cyst and the joint, causing joint fluid to flow in.^{9,11} Ganglion cysts connected to tendon sheaths are also generated by mucoid degeneration of tendon collagen fibers and cellular hyperplasia after mucin secretion.¹² Communicating ganglion cysts are more likely to recur after repeated excision without closing the communicating lesions.

Ganglion cysts are commonly adjacent to joints or tendons. Lee et al.⁵⁾ observed a communication stalk between the flexor hallucis longus tendon sheath and the surrounding joint of the ganglion cyst around the hallux in each patient in their series. In this study, most of the ganglion cysts were located on the dorsum, and such cysts about the extensor tendon sheaths or adjacent IPJ. Surgical treatment, considering the ganglion cyst and connections with the underlying pathology of adjacent joints and tendons, is challenging.^{5,7)} Additionally, complete excision of small ganglion cysts of the toe attached to the overlying thin skin is difficult. Even with complete resection, management through a comprehensive approach to all connections with the ganglion cyst, tendon sheath, and the joint is required.⁵⁾ Arthrodesis is suggested as an alternative treatment for cyst recurrence;^{1,4)} however, joint fusion for the treatment of benign cysts is normally not acceptable.

In our study, 7 of 8 cysts treated without IPJ fixation recurred. We guess that the high recurrence rate (87.5%) arose because many of the initial cases were pruruptured or already recurrent at the times of the index operations included in this study. The cyst margins were not clear, and soft-tissue quality was poor. The skin of the toe is thin, and the toes are vulnerable to friction and pressure within the shoes. Thus, the recurrence rate of toe ganglion cysts is thought to be higher, but there are few published reports of recurrent toe ganglion cysts, so it is difficult to compare our study with previous studies.

Space closing and motion restriction after cyst excision are maintained by temporary pin fixation of the toe IPJ communication of the adjacent joint and tendon sheath in the narrow space. Reducing the risk of recurrence via two mechanisms caused by fluid leakage may be possible and can lead to fibrous tissue healing at the excision site. Among the patients in this study, there were no recurrences after 8 pin fixation procedures, including 2 for recurrent cases (Fig. 6). We recommend excision with pin fixation rather than excision alone given the increased risk of recurrence or repeated reoperations in the absence of pin fixation.

Simple longitudinal pin fixation, which can lower the risk of recurrence without IPJ arthrodesis, can be a reasonable option to save the joint and reduce the risk of recurrence in the contexts of primary ruptured cysts and, especially, revision ganglion cyst excision. Pin fixation was maintained for 4 weeks to minimize the complications of pin site infection or joint arthritic changes in all study patients. No complications were observed at final follow-up.

Furthermore, most toe ganglion cysts were located in the distal joints: the first toe IPJ and the lesser toe DIPJs. In joint-nonadjacent ganglion cysts, there was no recurrence after excision without pin fixation. However, in patients with cysts adjacent to the IPJ, there was a large difference in the recurrence rates associated with excision only vs. excision with pin fixation. We expect that simple pin fixation after cyst excision can lower recurrence rates.

The present study had several limitations. First, its retrospective, nonrandomized design may have resulted in selection biases. Second, although toe ganglion cysts are rare, this study had a small sample size of 16 patients; more cases, including patients treated with excision and pin fixation and patients who experienced recurrence after excision only, would have strengthened the study.

In conclusion, temporary IPJ pin fixation after excision for ganglion cysts can be effective for preventing the recurrence of ganglion cysts adjacent to toe IPJ.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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