Endoscopic Curettage of Bone Cyst of the Fibular Head

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Abstract: Open resection of cystic or other benign intramedullary lesions of the fibular head and neck requires dissection and mobilization of the common peroneal nerve. The purpose of this Technical Note is to describe a minimally invasive approach of fibular head endoscopy for resection of a bone cyst or other benign intramedullary lesions of the fibular head and neck. The common peroneal nerve, biceps femoris tendon, and lateral collateral ligament are preserved.

The fibular head has a unique pyramidal shape, and the relations of the fibular insertion of the lateral collateral ligament, popliteofibular ligament, and biceps femoris tendon are consistent.1 The lateral collateral ligament, popliteofibular ligament, and biceps femoris tendon insert to the distal side of the lateral aspect of the fibular head, posterior aspect of the fibular styloid process, and lateromedial aspect of the fibular head surrounding the lateral collateral ligament, respectively.1,2 The common peroneal nerve runs distally along the posterior border of the biceps femoris tendon and across the lateral cortex of the fibular neck.3 For excision of an intramedullary lesion of the fibular head and neck, a safe zone is observed in the anterior half of the proximal 20 mm of the fibular head that would avoid injury to the peroneal nerve.4 However, creation of this bone window may damage the insertions of the lateral collateral ligament, popliteofibular ligament, and biceps femoris tendon or cause avulsion fractures of the fibular head. The purpose of this Technical Note is to report the details of endoscopic curettage of a bone cyst of the fibular head. It is indicated for a cystic lesion of the fibular head and neck. The same approach can be used for other benign intramedullary lesions of the fibular head and neck, for example, enchondroma. It is contraindicated for a malignant or aggressive benign tumor, for example, giant cell tumor. A malignant or aggressive benign tumor of the fibular head requires en bloc resection of the fibular head, including the lateral collateral ligament and the attachment of the biceps femoris tendon.5 It is also contraindicated if the lesion is extended distally beyond the fibular neck, in the presence of an acute pathologic fracture, or the presence of peroneal nerve palsy6 requiring surgical exploration at the region of the fibular neck. Tumors beyond the boundary of the medullary cavity,7 for example, osteochondroma, are also a contraindication (Table 1).

Technique

Preoperative Planning and Patient Positioning
Preoperative imaging including magnetic resonance imaging is important to confirm surgical indication and exclude a malignant or aggressive benign tumor. The lesion should be confirmed to be an intramedullary one of the fibular head and neck without breakage of the cortex (Fig 1).

The patient is in the lateral position. A thigh tourniquet is applied to provide a bloodless operative field. A 4.0-mm 30° arthroscope (Dyonics, Smith & Nephew, Andover, MA) is used for this procedure. Fluid inflow is by gravity and no arthropump is used.

Portal Placement
Proximal anterolateral and proximal posterolateral portals are used for this procedure. The proximal anterolateral portal locates at the anterior border of the lateral collateral ligament, 1 cm proximal to the fibular head. The proximal posterolateral portal is at the anterior border of the biceps femoris tendon, 1 cm proximal to the fibular head (Fig 2).
Exposure of the Superior Cortex of the Fibular Head

Five- to seven-millimeter incisions are made at the portal sites. The underlying subcutaneous tissue is bluntly dissected down to the potential space above the proximal tibiofibular joint. This is the initial working space for endoscopy to start with. Endoscopy of this potential space allows access to the lateral knee, proximal tibiofibular joint, and the fibular head and can deal with pathologies of the 3 zones.\textsuperscript{8,9} The fibular head is the most lateral zone, and therefore, the portals should be placed closer to the fibular head than those for endoscopy of the other 2 zones. Otherwise, instrumentation through the portals will be hindered by the lateral thigh, making reach of the fibular head difficult.

The proximal anterolateral portal is the viewing portal and the proximal posterolateral portal is the working portal. The fibroadipose tissue of the potential space is carefully resected. Initially, the arthroscopic view is obscured by the adipose tissue. The cutting blade of the arthroscopic shaver (Dyonics, Smith & Nephew) should face plantarly. Too medial or too lateral resection should be avoided to avoid damage to the lateral knee capsule or the lateral collateral ligament, respectively. The resection should also not go posterior to the biceps femoris tendon. The common peroneal nerve should be protected by the biceps femoris tendon as the proximal posterolateral portal is anterior to the tendon. After resection of the adipose tissue, the lateral collateral ligament can be identified. It is the important arthroscopic landmark of this procedure. The ligament is traced distally to the fibular head. The thick fibrous tissue over the superior cortex of the fibular head is dissected with a serrated banana knife (Acufex, Smith & Nephew) and resected with the shaver (Fig 3). The superior cortex of the fibular head is then exposed. This is a cortical area bounded laterally by the biceps femoris, popliteofibular ligament, and the lateral collateral ligament. Anteriorly, it is bounded by the anterior tibiofibular ligament that is frequently fused intimately

| Indications | Contraindications |
|-------------|-------------------|
| 1. It is indicated for a cystic lesion of the fibular head and neck | 1. It is contraindicated for a malignant or aggressive benign tumor, for example, giant cell tumor |
| 2. It is indicated for other benign intramedullary lesions of the fibular head and neck, for example, enchondroma | 2. It is contraindicated if the lesion is extended distally beyond the fibular neck |
| 3. It is contraindicated in the presence of an acute pathologic fracture | 3. It is contraindicated in the presence of peroneal nerve palsy requiring surgical exploration at the region of the fibular neck |
| 4. It is contraindicated in the presence of peroneal nerve palsy requiring surgical exploration at the region of the fibular neck | 4. It is contraindicated for tumors beyond the boundary of the medullary cavity, for example, osteochondroma |
| 5. It is contraindicated for tumors beyond the boundary of the medullary cavity, for example, osteochondroma | 5. It is contraindicated for tumors beyond the boundary of the medullary cavity, for example, osteochondroma |

Fig 1. Endoscopic curettage of a bone cyst of the fibular head of the right knee. The patient is in the lateral position. Magnetic resonance imaging of the illustrated case shows the cystic lesion (arrowhead) of the fibular head. (A) Sagittal view and (B) transverse view. (F, fibula; T, tibia.)
with the biceps femoris tendon. Posteriorly, it is bounded by the discrete posterior tibiofibular ligament. Medially, it is bounded by the proximal tibiofibular joint. This cortical area is the trapdoor for bone endoscopy of the fibular head and neck.

**Endoscopic Corticotomy of the Superior Cortex of the Fibular Head**

The proximal posterolateral portal is the viewing portal and the proximal anterolateral portal is the working portal. The superior cortex is resected with an arthroscopic burr (Dyonics, Smith & Nephew) to expose the bone cyst (Fig 4). The cyst wall fenestration can be enlarged by an arthroscopic probe (Dyonics, Smith & Nephew) and a smaller size arthroscopic burr. The size of fenestration is titrated to allow sufficient access to the cyst without disrupting the lateral cortex and the fibular insertion of the lateral collateral ligament.

**Endoscopic Debridement and Curettage of the Bone Cyst of the Fibular Head**

The proximal posterolateral portal is the viewing portal and the proximal anterolateral portal is the working portal. The viscous fluid of the cyst is drained. The cyst wall is curetted with an arthroscopic curette.

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**Fig 2.** Endoscopic curettage of a bone cyst of the fibular head of the right knee. The patient is in the lateral position. (A) The fibular head (FH), lateral collateral ligament (LCL), biceps femoris tendon (BT), and common peroneal nerve (CPN) are outlined. The proximal anterolateral portal (PAP) locates at the anterior border of the lateral collateral ligament, 1 cm proximal to the fibular head. The proximal posterolateral portal (PPP) is at the anterior border of the biceps femoris tendon, 1 cm proximal to the fibular head. (B) The endoscopic procedure is performed through the proximal posterolateral portal and the proximal anterolateral portal.

**Fig 3.** Endoscopic curettage of a bone cyst of the fibular head of the right knee. The patient is in the lateral position. The proximal anterolateral portal is the viewing portal and the proximal posterolateral portal is the working portal. The thick fibrous tissue over the superior cortex of the fibular head is dissected with a serrated banana knife (BK). (FH, fibular head; LCL, lateral collateral ligament.)

**Fig 4.** Endoscopic curettage of a bone cyst of the fibular head of the right knee. The patient is in the lateral position. The proximal posterolateral portal is the viewing portal and the proximal anterolateral portal is the working portal. The superior cortex is resected with an arthroscopic burr (AB). (FH, fibular head; LCL, lateral collateral ligament.)
(Arthrex, Naples, FL) and the lining is removed with an arthroscopic grasper (Arthrex) (Fig 5, Video 1, Table 2). It is important not to perforate the posterior or lateral cortex to avoid avulsion of the lateral collateral ligament and biceps femoris insertion or injury to the common peroneal nerve and its branch. The cyst can be packed with cancellous bone graft with a large bored drill sleeve if preferred.

**Discussion**

Open resection of lesions of the fibular head, especially for the posterior or medial ones, often requires dissection and mobilization of the common peroneal nerve. This endoscopic approach allows access to intramedullary lesions of the fibular head and neck. To maximize the area of access within the fibular head and neck, the cortical window at the superior surface of the fibular head can be enlarged to its boundaries, that is, proximal tibiofibular joint medially, lateral collateral ligament laterally, anterior tibiofibular ligament anteriorly, and posterior tibiofibular ligament posteriorly. To improve access to lesions extending further distally beyond the fibular neck, an accessory portal can be created at the safe zone in the anterior half of the proximal 20 mm of the fibula head. However, unlike the proximal posterolateral portal, in which the biceps femoris tendon is a constant surface landmark for the common peroneal nerve, there is no clear surface landmark to identify the common peroneal nerve in the fibular neck region. The accessory portal still bears the risk of injury to the common peroneal nerve.

The advantages of this approach include better cosmesis, less soft tissue dissection, no need of wound retraction, low risk of skin necrosis, less risky to the common peroneal nerve, and preservation of the biceps femoris tendon and lateral collateral ligament insertions. The potential risks of this procedure include injury to the lateral collateral ligament, incomplete resection of the lesion, iatrogenic fracture, and peroneal nerve injury (Table 3). An avulsion fracture of the lateral collateral ligament or direct injury to the ligament may cause postoperative knee instability because the lateral collateral ligament is the main resistor of varus loading. However, because the posterolateral complex and cruciate ligaments are usually intact in this situation, isolated deficiency of the lateral collateral ligament may still be tolerable.

![Fig 5. Endoscopic curettage of a bone cyst of the fibular head of the right knee. The patient is in the lateral position. The proximal posterolateral portal is the viewing portal and the proximal anterolateral portal is the working portal. The bone cyst (BC) is curetted with an arthroscopic curette (AC). (FH, fibular head.)](image)

| Table 2. Pearls and Pitfalls of Endoscopic Curettage of a Bone Cyst of the Fibular Head |
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| **Pearls**                         | **Pitfalls**                      |
| 1. The portals should be created close to the fibular head | 1. During resection of the fibroadipose tissue of the potential space above the proximal tibiofibular joint, the shaver should be kept in the center of the space to minimize the risk of injury to the surrounding important structures |
| 2. The biceps femoris tendon is a constant surface landmark for the common femoral nerve | 2. The size of the fenestration of the superior cortex of the fibular head should be titrated to just enough for debridement of the cyst. Excessive bone resection of the superior cortex may lead to an iatrogenic avulsion fracture of the lateral collateral ligament |
| 3. The lateral collateral ligament is the important landmark for the arthroscopic orientation | 3. Curettage of the cyst wall should be carefully performed so as not to perforate the posterior and lateral cortex, especially when the cortex is thinned by the cyst |

| Table 3. Advantages and Risks of Endoscopic Curettage of a Bone Cyst of the Fibular Head |
|-----------------------------------|-----------------------------------|
| **Advantages**                    | **Risks**                         |
| 1. Less wound complication        | 1. Injury to the lateral collateral ligament |
| 2. Less soft tissue trauma         | 2. Incomplete resection of the lesion |
| 3. Better cosmesis                | 3. Iatrogenic fracture and peroneal nerve injury |
| 4. Less risky to the common peroneal nerve | 5. Preservation of the biceps femoris tendon and lateral collateral ligament insertions |
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