

Handheld Osteotomes Facilitate Arthroscopic Elbow Osteophyte Removal



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Abstract: Arthroscopic elbow surgery is a challenging procedure in part because of the limited intra-articular volume of the joint, the congruence of the elbow articulation, and the close proximity of the neurovascular structures. Arthritic conditions that result in the development of bony prominences and osteophytes are usually amenable to arthroscopic management and include diagnoses such as osteoarthritis, rheumatoid arthritis, and valgus extension overload syndrome. Safe and efficient removal of these osteophytes can be problematic, however, because of technical difficulties often encountered while using arthroscopic burrs and shavers as well as the risks of inadvertent, iatrogenic injury to adjacent articular cartilage and other structures. A valuable and effective technique using small handheld osteotomes to facilitate the arthroscopic removal of intra-articular osteophytes and other bony prominences is described and shown.

Arthroscopic surgery of the elbow was initially indicated only for diagnostic evaluation and removal of loose bodies. The indications, and thus the number and type of procedures available to the arthroscopic surgeon to manage a wide variety of elbow conditions, have significantly expanded over the years. Elbow arthroscopy, however, is a technically demanding exercise, and iatrogenic injury to the intra-articular and extra-articular structures, including the nerves and arteries that cross the elbow joint, remains a significant concern.¹ Because of significant potential risks of elbow arthroscopic intervention, it is important to proceed in a stepwise and progressive manner that allows for the development of elbow arthroscopic skills and technical expertise while minimizing the risk for iatrogenic injury.²

A wide variety of procedures is commonly performed using elbow arthroscopic techniques. Many of these elbow conditions result in the formation of hypertrophic bony prominences and osteophytes. Osteoarthritis of the elbow is one of these conditions and differs somewhat from osteoarthritis in some other joints in that the articular cartilage is generally relatively well preserved in elbow osteoarthritis. The symptoms attributable to elbow osteoarthritis are felt to result from the presence of these hypertrophic osteophytes in combination with symptoms attributable to the commonly associated contracture of the elbow capsule.³ These characteristic intra-articular findings seen in patients with elbow osteoarthritis are also routinely identified in other common elbow conditions such as valgus extension overload. Posteromedial impingement owing to spur formation in patients with valgus extension overload significantly limits overhead performance and generates these characteristic signs and symptoms.⁴

An integral component of arthroscopic surgical management for these type of elbow conditions centers on the removal of these osteophytes, and arthroscopic techniques have proven very effective.^{5,6} Although the use of osteotomes is well described and commonly employed for open surgical procedures, the use of small handheld osteotomes, inserted through standard portal cannulas and used arthroscopically to remove elbow osteophytes, has not been well described. Nevertheless, these small osteotomes have been used routinely by the senior author (L.D.F.) for cases in which elbow osteophytes are to be removed for over 20 years. Furthermore, these same osteotomes used to

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Fig 1. From top to bottom: Arthroscopic suture grasper, straight 1/4" osteotome, curved 1/4" osteotome, and arthroscopic grasper.

remove elbow osteophytes can also be just as easily and effectively used arthroscopically within other joints such as the knee and shoulder.

These small osteotomes, variable in width and either straight or slightly angled, offer significant potential benefits and advantages when compared with arthroscopic shavers and burrs that are most commonly used for elbow osteophyte removal. The elbow joint is a very congruent articulation. This "hinge" joint creates an intra-articular environment in which the highly congruent articular surfaces are at significantly increased risk of iatrogenic injury at the time of osteophyte removal because of their immediate proximity to any devices used to remove these osteophytes. These small osteotomes are valuable because they can be very



Fig 2. From top to bottom: Enlarged view of the tips of the arthroscopic suture grasper, straight 1/4" osteotome, curved 1/4" osteotome, and arthroscopic grasper.



Fig 3. From top to bottom: Symmetry Surgical 1/8" curved osteotome 28-4953, Symmetry Surgical 1/4" curved osteotome 28-4956, Symmetry Surgical 1/8" straight osteotome 28-4903, and Zimmer 1/4" straight osteotome 852-00-04.

precisely positioned directly onto the base of the osteophyte to be removed and then carefully advanced with gentle mallet taps through the extent of the osteophyte until it is separated from its bony origin. Conversely, resection of osteophytes using an arthroscopic burr or shaver may be more likely to inadvertently make contact with the adjacent articular cartilage of the opposing joint surface. In addition, the intra-articular debris that an arthroscopic burr generates reduces visualization and can significantly limit the surgeon's view, making osteophyte removal more difficult and potentially increasing the risk of unintentional injury to the articular surfaces or other nearby structures. Another potential advantage of the use of

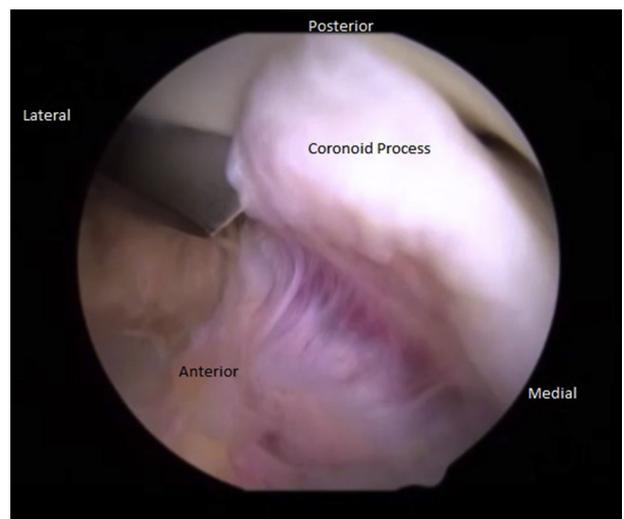


Fig 4. Patient is prone with the left arm over post. Viewing from the anteromedial portal of the coronoid osteophyte, the osteotome is introduced from the anterolateral portal for direct access to the coronoid osteophyte.



Fig 5. Patient is prone with the left arm over the post. Viewing from the posterolateral portal, the osteotome is working through the central posterior portal, allowing removal of all desired osteophytes of the olecranon.

these osteotomes compared with arthroscopic burrs relates to the risks of osteophyte removal within the posterior medial and posterior lateral elbow compartment gutters. Osteophytes occur very commonly in these gutters in both post-traumatic and degenerative osteoarthritis. These gutters, because of the very limited space available, can be difficult to access and visualize, making arthroscopic burr excision especially challenging. The proximity of the ligamentous structures within the gutters (medial ulnar collateral ligament and lateral ulnar collateral ligament), as well as the ulnar nerve immediately adjacent to the posterior medial gutter, makes the use of very controllable and easily visualized osteotomes particularly appealing. More importantly, because no suction is necessary and no spinning burrs or blades are used, there is less risk of inadvertent damage to the ligaments or ulnar nerve. Once these spurs in the elbow are broken free using the osteotomes, they are then easily removed using standard arthroscopic graspers.

Surgical Technique

The use of small handheld osteotomes can be easily incorporated into elbow arthroscopic procedures in which osteophytes or other bony prominences are to be removed. Following the induction of anesthesia, the patient is positioned prone on the table with appropriate padding of all bony prominences. The operative arm is draped over a post or placed in an arm holder. A nonsterile tourniquet is applied before prepping and draping. After draping, landmarks are palpated and marked to aid in portal placement. Likewise, the ulnar nerve is always palpated to confirm that it can be found

within the ulnar groove and that it is not subluxated or subluxatable. Twenty to 30 mL of normal saline is injected into the elbow joint via the soft spot using an 18-gauge needle. Diagnostic arthroscopy is then performed after the establishment of standard proximal anteromedial and proximal anterolateral portal sites using standard arthroscopic cannulae. After identification of the osteophytes, sequential removal is completed under careful arthroscopic visualization employing osteotomes (Symmetry Surgical, Antioch, TN; Zimmer Biomet, Warsaw, IN) of various sizes as necessary. Examples of these osteotomes are shown in [Figures 1-3](#). A preoperative 3-dimensional computed tomography (3D CT) scan is particularly helpful in identifying pathologic spur formation and for preoperative planning of the bony resections. Not all osteophytes to be removed require the use of these osteotomes, depending on the size, orientation, and

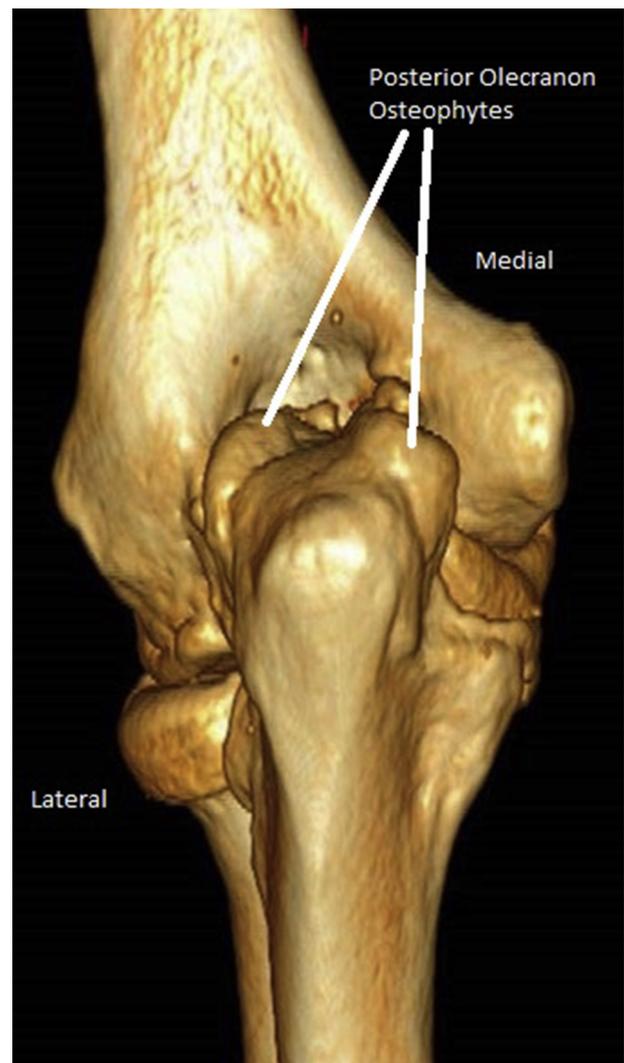


Fig 6. Three-dimensional computed tomographic reconstruction. Viewing from the posterior, showing posterior elbow and revealing “Mickey Mouse ears” osteophytes of the olecranon.

Table 1. Pearls and Pitfalls of the Handheld Osteotome Technique

Pearls	Pitfalls
Osteotomes less than 4 mm are ideal because of their ability to fit through small metal cannulas.	Most facilities may not have small osteotomes, thus requiring new purchase or removal of cannula from the portal.
Wider osteotomes are easily used through posterior portals without a cannula.	Larger bone resections may still require expanding the portal size to remove the bone piece.
Curved osteotomes can allow additional resection and improved angles.	Curved osteotomes do not readily fit through cannulas.

density of the osteophytes, as some of these spurs are relatively soft and easily resected using standard arthroscopic shavers or arthroscopic graspers. However, when the osteophytes are particularly dense, osteotomes can be especially useful. Removal of an anterior coronoid osteophyte is shown in the second case in [Video 1](#) and in [Figure 4](#). Finally, before transferring the arthroscope to the posterior elbow compartment, any other indicated anterior elbow compartment procedures such as capsular release, loose body removal, and synovectomy are completed.

Attention can then be turned to the posterior compartment. Typically, a posterior lateral viewing portal and a posterior central working portal are established initially. The olecranon process and fossa can be visualized and bony overgrowths and osteophytes evaluated. Once a specific plan for osteophyte resection is made, the osteotome can be delivered into the posterior compartment through the posterior central working portal percutaneously. This technique is shown in [Video 1](#) in the first and third cases. [Figure 5](#) also shows this technique. Progressive removal of osteophytes from the olecranon process, olecranon fossa, and posterior compartment gutters is continued until normal bony architecture is restored. Slight extension of the elbow increases the distance between the olecranon process spurs and the articular surface of the distal humerus and may provide additional protection for the articular cartilage. The fragments that are liberated using the osteotomes are then removed piecemeal using an arthroscopic grasper device ([Figs 1-3](#)). After the recontouring of the olecranon process, fossa, and gutters is completed, the elbow can be taken through a passive range of motion under direct arthroscopic visualization to ensure that all residual bony impingement has been alleviated. Even when very significant degrees of hypertrophic olecranon process and fossa osteophytes are present, resection and removal of these osteophytes can be efficiently

accomplished using these osteotomes while protecting the adjacent articular cartilage and other important structures ([Fig 6](#)).

Discussion

Elbow arthroscopy is a valuable surgical technique for the management of symptomatic elbow arthritis and for other etiologies that are characterized by the development of osteophytes, such as valgus overload and post-traumatic arthritis. Proper technique combined with a thorough knowledge of elbow anatomy, including the locations and pathways of the vital neurovascular structures, helps ensure that the risk of complications is minimized. In concert with these considerations, the use of small handheld osteotomes not only aids in achieving the goal of recontouring the intra-articular bony architecture of the elbow joint but also serves to effectively and efficiently accomplish this procedure while minimizing the iatrogenic risks.

The senior author (L.D.F.) has used small handheld osteotomes during arthroscopic elbow debridement cases to resect osteophytes approximately 150 times over the past 20 years. We have found that these osteotomes greatly improve access to and efficient removal of osteophytes from all areas of the elbow joint and also help protect the articular surfaces and other important nearby structures from iatrogenic injury. These osteotomes, although very efficient, do lead to large bone pieces, which have to be removed through the portal. Larger pieces may even require the portal to be enlarged. Although arthroscopic burrs are acceptable and used in many cases by the authors and others for osteophyte removal, there are inherent risks associated with these burrs that are obviated by the use of an osteotome. However, the advantage of the burr is that the bony pieces are removed through the shaver and therefore do not require an additional step or length to the portal incision ([Tables 1](#) and [2](#)). The authors recommend the use of these small osteotomes, when

Table 2. Advantages and Disadvantages of the Handheld Osteotome Technique

Advantages	Disadvantages
Quickly remove large osteophyte pieces	Large pieces then have to be removed from the existing portal
Protect the capsule and neurovascular structures during osteophyte removal	Curved and larger-width osteotomes may require removal of the cannula to enable its use
Limited amount of bony debris released during removal	Additional hand required during case than when using arthroscopic shaver or burr

possible, to aid in the removal of bony osteophytes during arthroscopic surgery of the elbow.

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