



# Arthroscopic Deepening Trochleoplasty: The Technique

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Trochleoplasty has become an accepted surgical solution for patients having recurrent patellar instability, based on the pathomorphology of trochlear dysplasia. Several surgical techniques exist to treat trochlear dysplasia, including arthroscopic deepening trochleoplasty (ADT). Similar to other endoscopic or arthroscopic procedures, it seems to be precise, less invasive with a reduced risk of infection, less painful, reduces the risk of arthrofibrosis and speeds recovery. This article is a detailed description of the procedure that has been slightly modified since the original description. The ADT procedure has now been performed on 56 knees in 39 patients (26 women and 13 men), median age 19 years (range: 12-46 years). An occurrence of a complication (1 deep venous thrombosis) has been noticed. Further surgery was needed for 6 knees. No redislocations have been observed. The indications for the procedure have been expanded to include patients with degenerative changes in the trochlea region and patients with severe trochlea dysplasia without instability suffering from chronic severe anterior knee pain that does not improve after 1 year of physical therapy. The ADT technique, with or without reconstruction of the medial patellofemoral ligament, has been found to be a reproducible and a safe technique without serious complications. *Oper Tech Sports Med* 23:136-142 © 2015 Elsevier Inc. All rights reserved.

**KEYWORDS** patella instability, trochleoplasty, trochlear dysplasia, patellar dislocation, anterior knee pain, patellofemoral, knee

## Introduction

Patellofemoral (PF) instabilities arising from trochlea dysplasia are increasingly treated with a surgical technique aimed at restoring normal knee anatomy. This article reviews the most common of these techniques currently in use.<sup>1-3</sup> In general, all of these deepening trochleoplasty techniques unload the compressive forces in the PF joint and both the Dejour and Bereiter technique reestablish osseous stability to the patella. Trochlear dysplasia is characterized by a shallow or dome-shaped trochlea based on too much bone in the proximal and central part of the knee. Some of the more important characteristics of the dysplasia include a medialized trochlear groove (trochlear asymmetry), a low lateral trochlear inclination angle, and a tilted patella.<sup>4,5</sup> The medialized groove causes the tibial tubercle-trochlear groove distance to increase, the low lateral inclination angle decreases the osseous stability, and the tilt

occurs as a consequence of the patella articulation with the lateral facet only.<sup>6</sup> The trochleoplasty procedure seems to more or less normalize these anatomical issues<sup>7</sup> and correspondingly it provides good clinical results. This is illustrated by multiple studies in which improvements in patella stability, reduction of anterior knee pain (AKP), and better quality of life have been shown compared with other surgical procedures in cases with severe trochlear dysplasia.<sup>8-23</sup> The open trochleoplasty is associated with the risk of arthrofibrosis, infection, prolonged pain, and scar formation.<sup>24</sup> With respect to other surgical procedures, the use of minimally invasive surgery has been found to reduce these risks; the same applies to the arthroscopic deepening trochleoplasty (ADT) presented here. This article describes the technique of the ADT, a technique that been slightly simplified since the original description.<sup>25</sup>

## Indication

The indication for ADT has until lately (and in our case series)<sup>20</sup> been recurrent patella instability in patients with trochlear dysplasia grades B, C, and D. However, recently the

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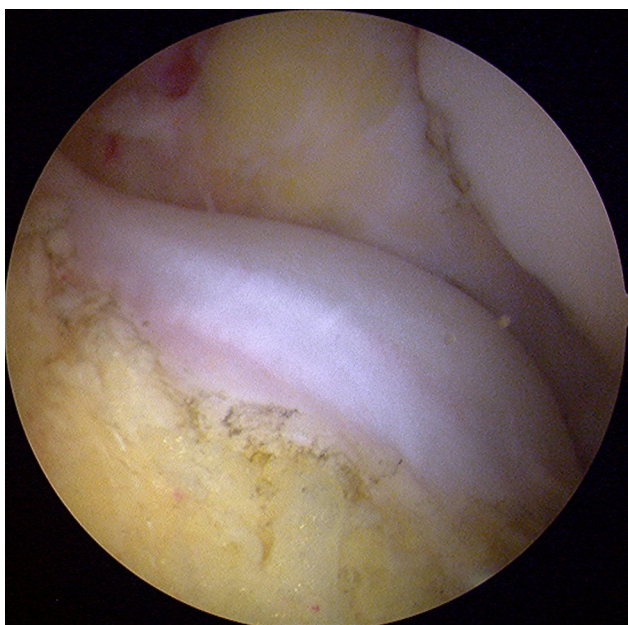
indication has been expanded to also include patients with the same degree of trochlear dysplasia but without instability. These patients may have been troubled by severe AKP for years without responding to at least 1 year of physiotherapy-guided training consisting of a variety of modalities such as an exercise program for lower limb, hip, and trunk conditioning, foot orthotic insoles, and taping.

## Technique

A tourniquet is rarely needed. A dose of intravenous antibiotics is given pre- and postoperatively. Antithrombotic prophylactic medicine is considered in patients older than 40 years or in cases with a history of thrombotic complications. This ADT is based on the Bereiter trochleoplasty, with a thin elastic osteochondral flap reinserted into a deepened groove.

## Preparation and Portal Placement

A standard knee arthroscopy is done through 2 standard anterior portals, and the menisci and the cruciate ligaments are tested. The trochlear configuration and cartilage are evaluated to confirm the magnetic resonance imaging (MRI) findings. A superior portal just medial to the quadriceps tendon is identified by insertion of a hypodermic needle, and a switching stick is introduced into the suprapatellar portal, allowing the arthroscope to be easily introduced into the suprapatellar pouch. A superior position gives an optimal view of both the trochlea and the patella (Fig. 1). The author prefer to use a 45° arthroscope, but a 30° arthroscope can be used as well. The position for the lateral suprapatellar portal is again localized by the needle technique. Most of the



**Figure 1** Arthroscopic view from the superomedial portal in a left knee with the patella subluxated laterally. The trochlea bump is visualized. Apparently there seems to be a slight shallow trochlea; however, this is an optical confusion caused by the knee curvature. What apparently is seen is the more distal part of the trochlea, but in the more proximal part the trochlea is dome shaped. (Color version of figure is available online.)



**Figure 2** This knee is undergoing an ADT and this demonstrates the standard anterior medial, the lateral portal, the arthroscope in the superomedial portal, and the shaver in the PassPort cannula laterally. (Color version of figure is available online.)

instrumentation is introduced through this portal, meaning that the correct placement of this portal is vital in both the frontal and transversal planes, to give the right working angle for the instruments; too distal or too posterior placement of the portal can be detrimental. A 6-mm PassPort Button Cannula (Arthrex Inc, Naples, FL) is useful as a working portal (Fig. 2).

## Creation of the Cartilage Flap

By the use of a 90° radiofrequency device introduced through the lateral suprapatellar portal, the synovium or periosteum is released from the area proximal to the trochlea cartilage. The release is continued as proximal as necessary—shaving a clear area for the placement of the proximal anchors is needed at the end of the procedure. Once the bone is cleared of periosteum, a 4-mm round shaver burr is used to take away bone proximal and posterior to the trochlea cartilage. The release of the cartilage flap is initiated by moving the shaver burr from medial to lateral and vice versa. Slowly, the progression of the shaver continues more and more distally beneath the cartilage. As a supplement to the shaver, a straight or curved osteotome (6 mm × 27 cm) can be used, similar to open surgery. By adding the osteotome, the bone resection at the most lateral part of the trochlea is minimized, helping in achieving a normal lateral trochlear wall, thereby a more anatomical lateral trochlea inclination angle. The cartilage flap separation from bone is continued distally until the shaver meets the curvature of the femoral condyles. Before this point is reached distally, it is recommended to change the 4-mm shaver burr to a smaller 3-mm burr, thereby minimizing the bone resection in the area close to the hinge of the cartilage flap. The release should be continued in the medial and lateral directions; otherwise, the hinge of the flap will not become sufficiently elastic (Fig. 3).

## Formation and Shaping of a Deeper Trochlear Groove

The aim is to create a new groove with the correct trochlear depth and sulcus orientation. Therefore, the groove needs to be

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