Inside-Out Trans-Arthroscopic Drain Application During Knee Joint Arthroscopy

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Abstract: Although knee joint arthroscopy is one of the most frequently performed surgical procedures worldwide, there is no consensus on how to apply a drain in the joint if it is decided to use one. Therefore we describe a simple technique to safely apply a drain intra-articularly under full arthroscopic control, avoiding placement of the drain through the arthroscopic portal.

Arthroscopic knee joint surgery is a relatively hazard-free procedure that is performed by a wide variety of surgeons. It can be regarded as one of the most frequently performed surgical procedures worldwide. Partial meniscus resection has been declared the most common orthopaedic surgical procedure. Despite the immense technical developments made in arthroscopy until today, the evidence regarding several general aspects of surgery is conflicting or absent. There remains controversy on the application of a tourniquet, use of antibiotic prophylaxis, or use of a drain. When one is applying an intra-articular drain, there are multiple ways to do so. However, imperfect placement can have consequences such as muscle damage, malfunction, hematoma, slippage, drain-related wound complications, and even the initiation of an infection. Therefore we report on a simple technique to safely place the drain intra-articularly (inside out) under full arthroscopic visualization to reduce the typical drawbacks.

Surgical Technique

Our technique can be applied at the end of every arthroscopic knee joint procedure when 2 standard portals (e.g., lateral and medial) have been used. Arthroscopy in this technical description was performed with an Arthrex Synergy camera system (Arthrex, Naples, FL). After arthroscopy, the operative leg is fully stretched with the camera in the anterolateral portal visualizing the patellofemoral joint. The camera is then positioned to visualize the medial working portal. The drain, usually 10 charrier (the drain used in this technical description is manufactured by All Pro Medical Apparatus and Instruments, Beijing, China), connected to the regular spear as equipped during open application, is carefully introduced into the joint through the medial portal under full arthroscopic control (Video 1). The spear is then advanced proximally, passing the patellofemoral joint without making contact with the cartilage surfaces. The maneuver is closely monitored by observation with the camera. Then, the intended capsular location of perforation is determined, which can be either the medioproximal recess or lateroproximal recess. Yet, any desired position is feasible. We routinely apply a proximolateral position. Finally, the capsule and skin are perforated in an inside-out manner with the aid of the spear by simultaneous arthroscopic and macroscopic visualization. Instrumented outside resistance using scissors can be helpful. The spear is then manually pulled out of the joint, the drain is cut, and the final placement can be determined by use of the arthroscope. The intra-articular position can be corrected or changed, if required, by use of the arthroscopic instruments (Fig 1). If sought, multiple...
drains can be applied in this way at different locations across the knee joint (Fig 2).

**Discussion**

General perioperative management during knee joint arthroscopy has been reported to be very heterogeneous regarding analgesia, antibiotic prophylaxis, tourniquets, knee drains, and physiotherapy. Some surgeons use the aid of a tourniquet, whereas others do not. The current evidence regarding such use is inconclusive. In addition, a meta-analysis published in 2009 reported the existence of limited evidence to suggest that a tourniquet assists in arthroscopic knee surgery, with the only difference being that it does significantly increase operative visibility during anterior cruciate ligament surgery. By use of a tourniquet, intraoperative bleeding is limited to increase the visibility of the surgical site. Commonly, the tourniquet is deflated after cessation of the procedure when the wound has been closed. Potential bleeding sites are missed and may be related to different postoperative complications such as hematoma, pain, and infection and thus prolonged rehabilitation. Therefore the application of an intra-articular drain can be reasonably indicated.

The current practice among surgeons when intra-articular drain application is considered has to be described as heterogeneous. The general consensus regarding drain application is dependent on the intensity of the procedure (e.g., multiligament reconstruction vs partial meniscectomy) and operation duration. Despite this, the existing evidence is inconclusive regarding the use of a drain during anterior cruciate ligament replacement surgery, and there are no high-level data regarding the topic of meniscus or cartilage surgery. Tatari et al. have reported, in a
comparative trial, that subtotal meniscal resection, drilling of the osteochondral faces, and the longer duration of the operation increase the amount of fluid within the joint, and they recommend the use of a drain. When only partial meniscal resection with or without chondral debridement and limited synovial or plica resection is performed, Tatari et al. consider use of a drain unnecessary.

Coupens and Yates\(^3\) investigated a cohort of 60 patients who had undergone arthroscopic knee surgery. The cohort was divided into patients with tourniquet use or without tourniquet use and based on whether a drain was used postoperatively. Patients who received a drain and patients in whom no tourniquet was used had fewer hemarthroses and greater range of motion during all periods of follow-up than patients who had a tourniquet or did not have a drain.

Typical complications after standard arthroscopy are damage to the articular cartilage, infection, postoperative effusion and hemarthrosis, or persistent drainage from portals.\(^1\) The general rate of infection has recently been reported among about 432,000 arthroscopies.\(^1\) The incidence of infection requiring reoperation after knee arthroscopy from 2004 to 2009 was 0.15% in this collective of patients. The only parameter to increase the probability of infection was gender (male).\(^1\)

When knee joint arthroscopy is performed with the aid of a tourniquet and the operation time is prolonged or the procedure is complex, application of an intra-articular drain might be reasonable even though there is no supporting evidence. Yet, to our knowledge, the method of application of such a drain in the joint has never been described or examined in the literature. Although there are multiple ways to realize the application, one frequently used method is to surpass the drain through the sitting arthroscopy stem. Skin closure is limited because the drain is blocked, the chances of slippage are increased, persistent secretion alongside the drain is possible, and finally, wound complications may arise (Fig 3). To avoid such drawbacks, we describe a safe method to apply a drain intra-articularly. The advantages of this technique are that intra-joint placement is under full visual control and the final position of the drain can be easily selected (e.g., when one does want the drain to be placed right next to an area that has just undergone microfracture). Furthermore, the site of outside skin perforation can be easily selected as well and is not predetermined by already existing arthroscopy portals. If the operative extremity (knee joint) is kept in an elevated position postoperatively, the drain outlet (suprapatellar recess) is at an ideal location to allow inside-out fluid flow. The drain does not impede the suture material used to close the arthroscopy portal. The chances of drain slippage, persistent fluid secretion alongside the drain, and wound complications are reduced because the drain is sitting tightly within an isolated perforation.

One limitation of the described technique is that it might require a very minimally longer operation time. The learning curve is very steep, yet the general operation time should not be significantly affected when the technique is being conducted routinely. The risk with drain application is that it may cause accidental damage to the articular cartilage of the patellofemoral joint with the spear, in particular the trochlear cartilage. Because the application is performed under full visual control, one can track the movement of the spear during the whole process and avoid such iatrogenic pathology.

**References**


**Fig 3.** Macroscopic image of a left knee, with the patient in the supine position. One drain has been applied after completion of knee arthroscopy. The drain is diverted through the anterolateral portal, and wound closure has been performed proximal to it. The arthroscopy portals remain affected by the drain.

