CASE REPORT

Migration of an Extra-Articular Broken Stopcock into the Knee Joint: an Unusual Complication of Knee Arthroscopy

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Introduction

Despite the increased use of arthroscopy for the evaluation and treatment of intra-articular knee pathology and the advanced procedures that are being performed through arthroscopes, the incidence of instrument breakage has remained low¹. Careless handling and/or defects in instrument design and composition can cause such breakage. There are reports describing breakage of scalpel blades^{2,3}, a shaver⁴, an arthroscopic probe⁵ and a telescope⁶ during arthroscopy. Occasionally, the missing instruments has not been noticed, and has remained in the knee joint for several months to years, resulting in persistent pain and edema^{7,8}. Here we present a case of a broken stopcock device that had disconnected from the sheath and migrated insidiously into the knee joint through the portals; it was detected immediately on completion of the procedure. To the best of our knowledge, this is the first reported complication involving migration into the knee joint associated with this type of extra-articular arthroscopic device. The purposes of reporting this case are to increase orthopaedic surgeons' awareness of complications that can occur even with relatively low-risk procedures and also to emphasize that all instruments, including extraarticular sheaths, should be examined carefully when removed from the joint during arthroscopic procedures.

Case Report

A 51-year-old woman was hospitalized with a 4 month history of right knee joint pain. On physical examination, tenderness was found in the medial joint line, especially on the posteromedial side. X-ray films showed the joint space was well preserved; however, a tear in the posterior horn of the medial meniscus was identified by magnetic resonance imaging (MRI). Routine arthroscopic examination of the knee joint through the standard antero-lateral and antero-medial portals

confirmed the MRI findings, leading to an arthroscopic partial meniscectomy. To examine the posterior compartment, a posterolateral portal was established with the knee in 90° of flexion and assisted by insertion of a 18-gauge spinal needle. A second arthroscopic sheath was inserted with a trochar into the postero-lateral compartment. After removal of the trochar, the arthroscope was moved from the antero-lateral to the postero-lateral portal and the postero-lateral compartment examined, following which an identical method was used to evaluate the posteromedial compartment. Subsequent to this procedure, while suturing the arthroscope portals, it was found that the stopcock that had been connected to the arthroscope sheath had been detached and missing. Because this device had been in the extra-articular area during arthroscopic surgery, it was considered unlikely to be in the joint; the operation room floor was therefore searched. Next, the whole surgical field was examined carefully, but the stopcock was not found. Accordingly, an image intensifier was used to determine whether the stopcock was in the knee joint. The image intensifier revealed the detached stopcock in the postero-lateral compartment of the knee joint (Fig. 1). A small posterolateral skin incision was made under local anesthesia (Fig. 2), and the stopcock device in the joint removed (Fig. 3).

Discussion

Arthroscopy of the knee is a commonly performed procedure with a low reported complication rate. Breakage of the many types of hand instruments used in arthroscopy is a widely known potential complication of which every orthopaedic surgeon is aware⁵. In *et al.* have reported that a bendable three-piece motorized shaver designed to reach deep into the joint failed at the junction of the metal tip and plastic bar⁴; Gruson *et al.* have reported a case of broken scalpel tip² and Oztekin has reported a case of a broken probe tip that migrated

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Fig. 1 Stopcock visible within the knee joint under fluoroscopic view in the recovery room.

into the extra-articular space⁵. As reported by Small, there is a 0.05% incidence of instrument failure and arthrotomy is required to remove pieces of broken instruments in 9.6% of instrument failures¹. Instrument breakage was more common during the early days of arthroscopic surgery, because it occurs more frequently during the early part of the learning curve⁹.

In most cases reported so far, an instrument within the joint has detached during arthroscopic surgery and remained

Fig. 2 Intraoperative photograph showing removal of the stopcock under fluoroscopic control through a small incision on the postero-lateral aspect of the knee joint.

Fig. 3 Stopcock after removal.

within the joint. However, in our case the stopcock was located in the extra-articular space and had detached from the arthroscopic sheath and migrated into the joint through the sheath. As far as we know, this is the first reported case of a device that was in the extra-articular space being found within the joint. Arthroscopic sheaths are usually inserted into joints with a trochar; nevertheless, occasionally, an error is made and the sheath inserted without a trochar. We infer that in our case, the stopcock must have detached from the arthroscopic sheath while it was on the Mayo stand, accidentally rolled into the sheath, and then passively migrated into the knee joint during insertion of the arthroscope without trochar insertion. It is possible that the stopcock was within the arthroscopic sheath and delivered to the anterior compartment of the knee joint during insertion of the arthroscope, after which it migrated to the postero-lateral compartment of the knee joint aided by turbulent flow. Macroscopic examination of the stopcock device revealed breakage from metal fatigue. Only a few tension peaks are reportedly sufficient to cause fatigue breakage of the materials used in these devices¹.

Both during and post arthroscopic surgery, if broken parts have detached, it is imperative to minimize knee motion to avoid driving the fragment deeper into the joint. Access to fluoroscopy is essential when the retained fragment is small, buried below the cartilage or within the soft tissue, or cannot be located following diagnostic arthroscopy. Though formal arthrotomy may be necessary when arthroscopic retrieval is unsuccessful, we were able to avoid it in our case. In conclusion, the experience described here highlights the importance of examining all devices during and after arthroscopic surgery. In addition, surgeons should ensure that they handle devices safely and as recommended by the manufacturer, for example, that they insert arthroscopic sheaths with a trochar. Investigation of such failures can also provide insights into better designing of instruments in the future.

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