Technical Note

Targeted Partial Arthroscopic Trapeziectomy and Distraction: Surgical Technique

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Abstract: Basal joint osteoarthritis is a real public health problem, yet there is no consensus on its treatment. Although total trapeziectomy, as well as arthroplasty, provides long-lasting efficacy, it does not seem to be adapted to a young population with complications that are often very difficult to manage. In the era of minimally invasive surgery, there is a real interest in finding conservative therapeutic alternatives for young subjects that allow them to "pass a painful milestone" and, thus, postpone the least conservative interventions. This article details the surgical technique of an arthroscopic and conservative technique: The Targeted Partial Arthroscopic Trapeziectomy and Distraction based on two goals: targeted resection of painful arthritic lesions and distraction of the joint to restore ligament tension and hopefully regrow fibrocartilage on resected lesions.

Introduction

Basal joint osteoarthritis is a real public health problem, yet there is no consensus on its treatment. Conventional treatments are mainly nonconservative and do not allow for reversion to other less invasive options.[1] Although total trapeziectomy, as well as arthroplasty, provides long-lasting efficacy, it does not seem to be adapted to a young population with complications that are often very difficult to manage.[2] Consequently, many people have tried to describe arthroscopic techniques that mostly involve complete resection of the carpometacarpal articular surface with the addition of tendon interposition,[3] chondrocytes,[4] or autologous fat[5] without really proving a therapeutic superiority with hemitrapeziectomy alone. Moreover, the arthroscopic techniques described are mainly of therapeutic interest for arthrogenic friction lesions, but they do not target the repair of trapeziometacarpal hyperlaxity acquired by the ligamentous destruction of the trapeziometacarpal joint.[6] In the era of minimally invasive surgery, there is a real interest in finding conservative therapeutic alternatives for young subjects that allow them to "pass a painful milestone" and, thus, postpone the least conservative interventions. This article details the surgical technique of an arthroscopic and conservative technique: The Targeted Partial Arthroscopic Trapeziectomy and Distraction (TPATD) (Video 1). This technique is based on two goals: targeted resection of painful arthritic lesions and distraction of the joint to restore ligament tension and hopefully regrowth of fibrocartilage on resected lesions.[7]

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Surgical Technique

Installation

The procedure is performed on an outpatient care basis under regional anesthesia using a tourniquet. The patient's arm is secured to the arm board and the Chinese finger on the thumb is used to apply 3−5 kg (6.6−11 lbs) traction along the arm's axis. It is necessary to have an X-ray machine available in the room that is compatible with arthroscopy.

It is also necessary to have a fluoroscopy device compatible with arthroscopy. A sticky tape is added to the base of the Chinese fingernail because, often with traction, distraction is easily lost intraoperatively

because the thumb slides around the Chinese finger. This is very important because the intra-articular space is very narrow. Palpation of the bony reliefs, as well as drawing with the distraction, allows the joint spaces to be located more easily (Fig 1).

Arthroscopic Exploration

Intra-articular introduction of 25-gauge hypodermic needles allows the correct positioning of the entry points to be verified by fluoroscopic control. This allows us to avoid making a mistake with the scapho-trapeziotrapezoid joint, which is very close, but this step is not mandatory. The needles are left in place to introduce an intra-articular injection of physiological saline solution, allowing the joint to be distended and, thus, facilitating the introduction of the instruments (Fig 1).

The scope (30°, 2.5-mm diameter; Stryker, Bloomington, MN) is introduced in the 1-R portal and the shaver (Stryker; 2.5 mm) in the 1-U portal. To respect the sensory nerve structures, a 3-mm skin incision will be made, and a careful dissection down to the joint capsule will allow the radial sensory fibers, the main source of complications of this technique, to be removed. In practice, we start with a 1-U portal, and then the 1-R portal is identified by transillumination and can be used as an instrumental portal.

The first phase of the arthroscopic procedure consists of a complete synovectomy with a shaver, reversing the shaver and scope positions.

Once the synovial flanges have been excised with a shaver, the osteocartilaginous state of the joint is evaluated to note ligament relaxation and to note all osteoarthritic lesions (partial, total, single lesion, multiple lesions, etc.) (Fig 2). A probe can be used to check the integrity of the ligaments and to detect distension of the capsuloligamentous structures and the presence of free intra-articular osteophytes (Fig 2).

The ligamentous structures of the joint are activated with the shaver without being too aggressive (Fig 3).

Targeted Partial Trapeziectomy

Once the reactive synovial hypertrophy has been resected and the joint is clear, resection of the bare subchondral bone using a 3-mm motorized burr (Stryker; 3 mm) induces a "bloody dew" (Fig 4), which is intended to promote regrowth of fibrocartilage. Only osteoarticular osteoarthritic lesions are resected, leaving healthy cartilage areas in place.

The resection could be done during either "dry" or "wet" arthroscopy, depending on the surgeon's preference. We stop the subchondral bone resection once we obtain a satisfactory bloody dew (Fig 5). However, we recommend combining it with episodes of lavage

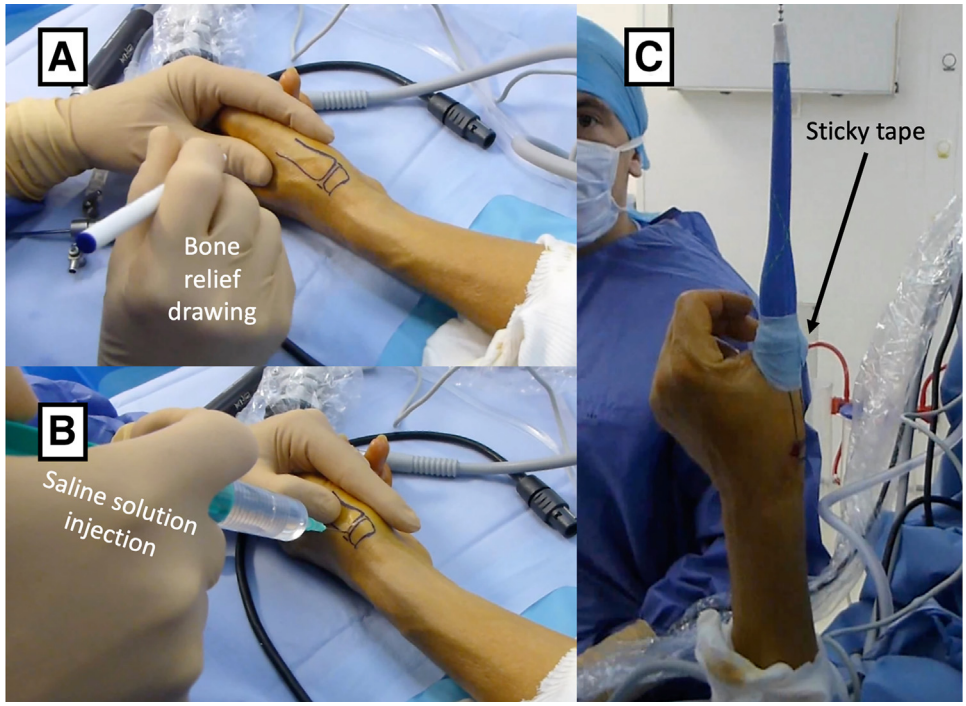

Fig 1. Intraoperative setup. Arthroscopy of the trapeziometacarpal joint is relatively difficult because of the narrow intra-articular space and the difficulty of maintaining traction. Good installation is essential. (A) Drawing the skin incisions and bone reliefs after careful palpation may be useful before applying traction. (B) Introduction of a 25 G needle of saline solution into the joint is performed to distend it. This step can be done before or after traction. (C) Traction of the thumb with the placement of sticky tape between the skin and the Chinese finger to prevent the thumb from slipping down.

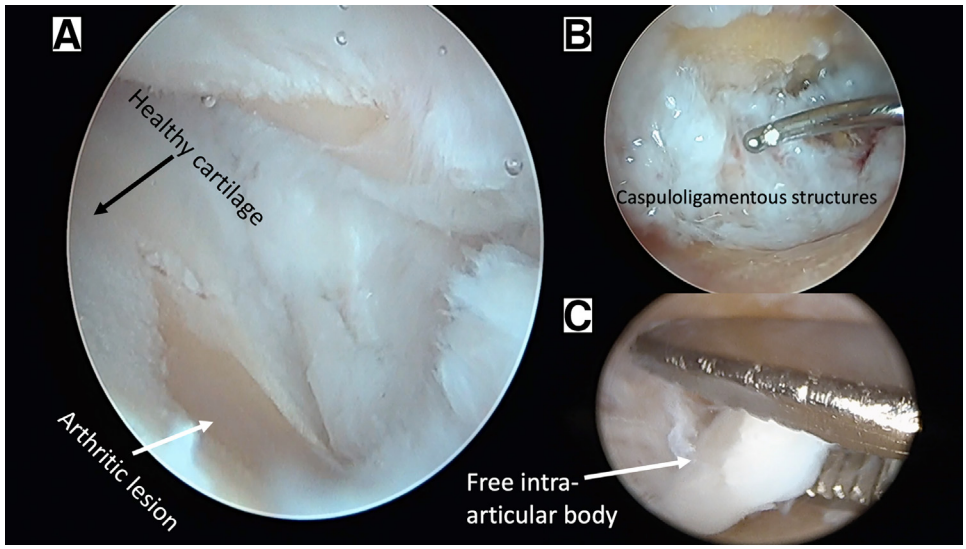

Fig 2. Arthroscopic exploration. (Arthroscopic view with optics in 1U and instrumental route in 1R). (A) Loss of bipolar articular substance of the trapeziometacarpal joint. Conservation of healthy cartilage in adjacent areas. Above, the articular surface of the metacarpal is shown. Below, the trapezium is shown. The portals can be alternated to better observe the entire joint. (B) Ligament testing with the probe showing relaxation of the capsuloligamentous structures. The probe should press on the capsuloligamentous structures to assess their strength. (C) Removal of osteophytes and intra-articular foreign bodies that may interfere with visibility during the rest of the procedure. The largest osteophytes will be removed using Mosquito forceps.

suction to remove osteocartilaginous debris and, above all, to avoid bone damage caused by the heat of milling during dry arthroscopy or the "snowstorm" effect during wet arthroscopy. To ensure proper aspiration of debris, the cannula of the burr can be separated from its motor blade, and only the cannula can be inserted, making it easier to aspirate large osteocartilaginous debris (Fig 6). Then, intra-articular cartilaginous loose bodies are removed. The osteophytes are resected using Mosquito forceps, rodent forceps, or the burr.

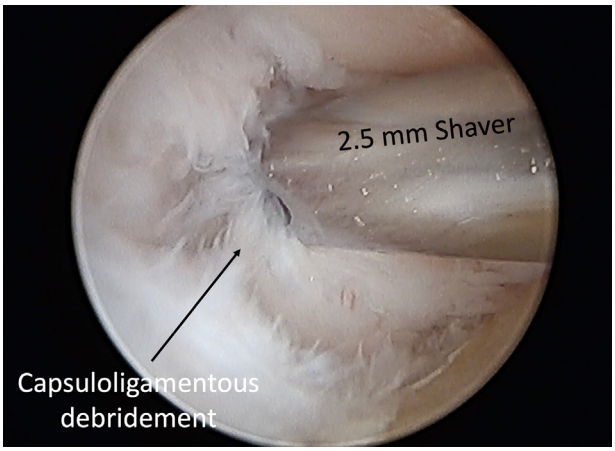

Fig 3. Ligamentous debridement (Arthroscopic view with optics in 1U and instrumental route in 1R). The debridement should cover all capsuloligamentous areas of the joint, thus increasing the effect of distraction by releasing adhesions. Although the debridement should be global, it should not be too aggressive to allow ligament healing. The diameter of the shaver must be 2.5 mm to be able to " move " freely in the joint.

Bone Fixation

Once the resection was deemed satisfactory and a good joint lavage was performed, the limb's traction was maintained, and two divergent pins were placed under fluoroscopic control to maintain the joint distraction and promote the development of a postoperative hematoma. Two K-wires were introduced using a motorized driver from the base of the metacarpal to the body of the trapezium (Fig 7). These K-wires were left in place for 6 weeks and then removed. Initially, we performed this intermetacarpal pinning, but we found that there were more complications with this pinning than with carpometacarpal pinning. We also recommend that the distal end of the pins not be buried under the skin to avoid friction. A final arthroscopic check may be performed even after osteosynthesis.

Postoperative Care

Once the fluoroscopic appearance of the construct is deemed satisfactory, a dressing is made without any suturing. Immobilization consists of the patient wearing a semi-rigid orthosis of the thumb column for the first 6 weeks postoperation. Physiotherapy was started immediately, including mobilization of the interphalangeal joint and wrist.

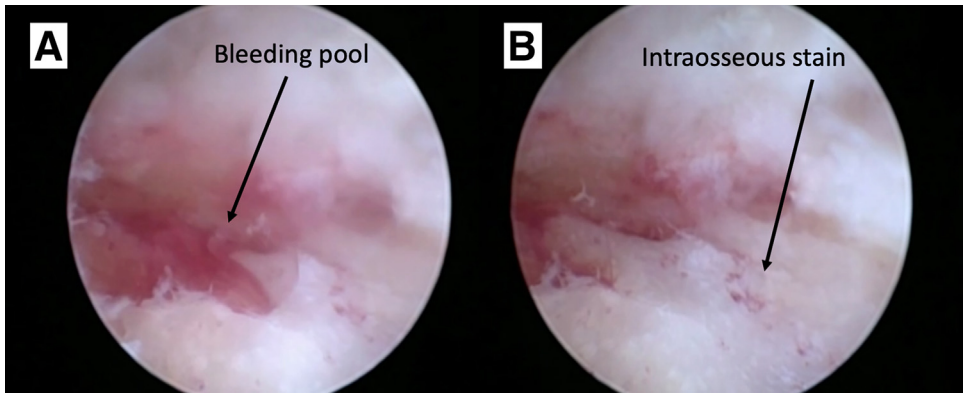

Fig 4. Visualization of the "Bloody Dew". (Arthroscopic view with optics in 1U) The appearance of a "bloody dew" means that the depth of osteocartilage resection is sufficient. This bloody dew can appear as a bleeding pool (A) or as an intraosseous stain (B).

Discussion

Trapeziometacarpal osteoarthritis has both ligamentous and articular components. In the management of osteoarthritis of this joint, there are two possibilities for ligament reconstruction: ligamentoplasty (several techniques described) or button suspensioplasty. However, ligament reconstruction appears to be less effective with ligamentoplasty than with the use of button suspensioplasty.[8] In our technique, the preservation of trapezium height makes it difficult to perform ligamentoplasty and other procedures to tighten the ligamentous system. We believe that distraction and strict immobilization with two pins can create a "relative" stiffness and allow, after the ligamentous structures have healed, healing in the tension position. When compared to trapeziometacarpal arthrodesis, this almost inevitable but relative postoperative stiffness does not seem to be a source of functional discomfort.[9] We do not believe that TPATD allows the arthrosic phenomenon to be radically resolved, but it does allow conventional nonconservative techniques to be postponed as long as possible and to "pass a painful milestone." It is, therefore, suitable for a young population that does not wish to undergo invasive procedures, although it can be used in an older population. In the literature, simple debridement and synovectomy seem to report a significant improvement in pain, functional scores, and pinch strength,[10] and we believe that ligament retensioning will allow these results to be sustained for longer.

It should be noted that at 6 months, the radiographs may appear surprisingly uncorrelated with the patient's clinical condition.

In our experience, we believe that the main complications are sensory nerve damage and algodystrophy. We advocate careful soft tissue dissection, especially

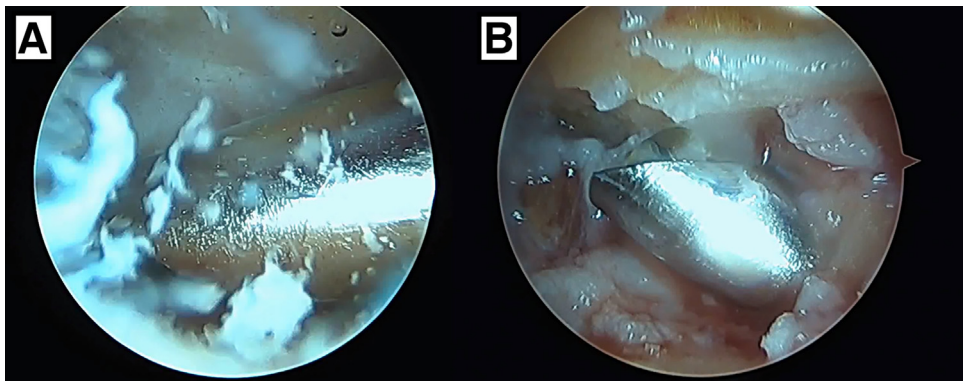

Fig 5. Targeted partial arthroscopic trapectomy. (Arthroscopic view with optics in 1U and instrumental route in 1R). This step can be performed in wet or dry arthroscopy using a 3-mm drill. (A) Wet arthroscopy: The main disadvantage is the "snowstorm" effect produced by the trapeziectomy, which may hamper arthroscopic visualization (as presented here) We do not recommend this step in a wet environment. (B) Dry arthroscopy. The main disadvantage is the risk of thermal burns to the bone, which may impair fibrocartilage regrowth. Therefore, we recommend that you perform several washouts to avoid the accumulation of debris and to avoid any risk of thermal damage.

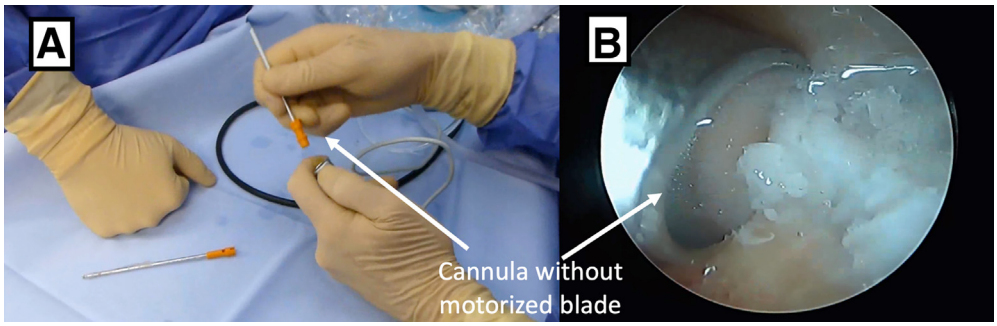

Fig 6. Advice for intra-articular aspiration under arthroscopic control. (A) The burs from the Stryker Laboratory can be removed with the use of the burr cannula alone. The Targeted Partial Arthroscopic Trapeziectomy and Distraction (TPATD) produces a lot of intra-articular debris, and aspiration with the motorized blade can be obstructed by the multitude of debris. Abundant joint cleaning is necessary, and aspiration with a large diameter cannula helps remove this debris. (B) Arthroscopic view with 1U optics: Removal of debris with the cannula in wet arthroscopy.

when making the approaches. The preservation of the trapezium height, especially by targeted resection of arthritic areas, is, in our opinion, an argument in favor of a conservative approach rather than a hemi-trapeziectomy, excising the entire articular surface.[3] However, this is a technically demanding surgery,

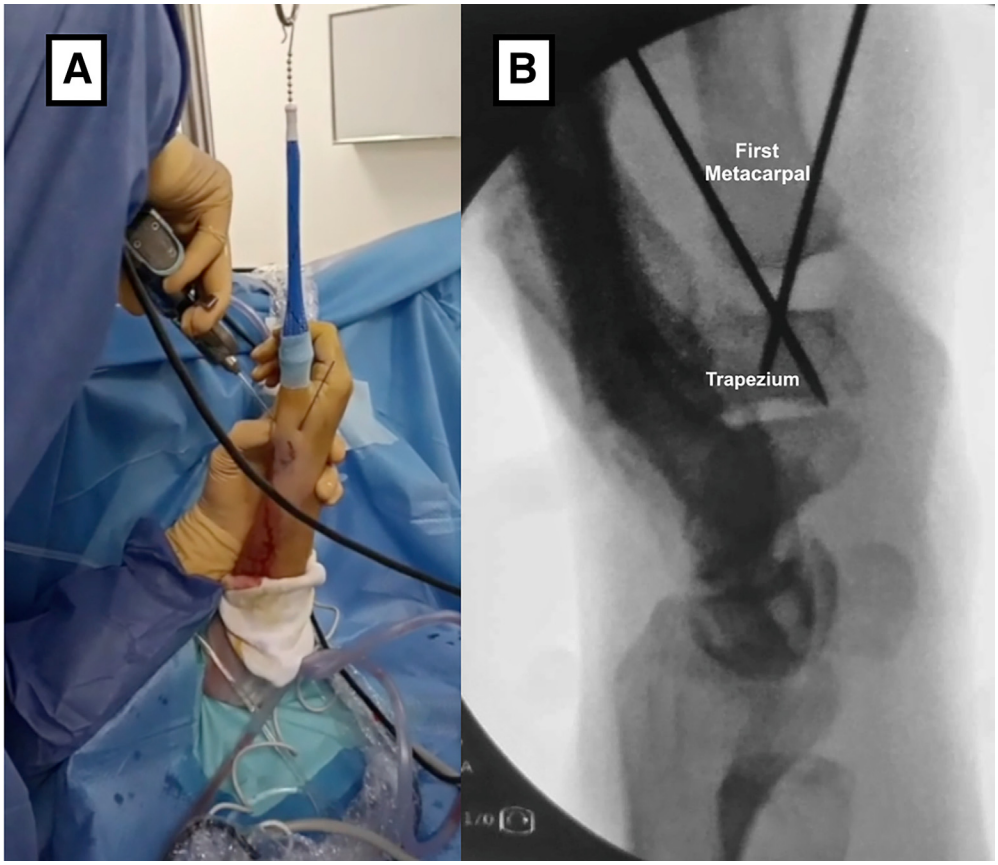

Fig 7. Bone fixation method allowing distraction of the trapeziometacarpal joint. (A) Intraoperative view of the placement of the 1-mm wires without releasing traction. The wires are inserted from distal (metacarpal) to proximal (trapezium), with less risk of nerve damage. To avoid discomfort, they will not be buried under the skin. (B) Intraoperative radiograph with the wires in place but after removal of the distraction. Note the intra-articular space maintained by the pins.

Table 1. Surgical Advice and Pitfalls

Advice	Pitfalls
- Make sure that you are in the trapeziometacarpal joint and not in the scaphotrapeziotrapezoid joint (using fluoroscopic control and a 20 gauge hypodermic needle). - Distend the joint by intra-articular injection of saline solution. - Use sticky tape to prevent the Chinese fingernail from coming off under traction. - Remove the motorized blade to facilitate the aspiration of osteo-cartilaginous debris. - Use transillumination to perform the 2nd portal.	- Irrigate the joint during milling to avoid thermal burns of the subchondral bone. - Leave traction in place for pinning. - Perform a careful dissection of the approaches. - Instruments that are too large will interfere with the surgery, possibly resulting in iatrogenic injuries.

particularly because of the narrow and difficult-to-see intra-articular space. In Table 1, we share some tips to help surgeons facilitate the surgical technique.

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