Dry Arthroscopy of the Shoulder

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Abstract: A technique to perform glenohumeral arthroscopy without using arthroscopic fluid for visualization or instrumentation is presented. The patient is placed in the beach-chair position. No traction is applied. Portal placement is performed as usual. Water flow is used only sporadically to wash the joint cavity, and then it is immediately aspirated with a synoviotome suction pump. The entire exploration and instrumentation occur within a pressure-free dry joint. We have applied this technique in more than 50 patients, and in none of these cases was there a need to switch from the dry to the wet technique. By use of this surgical technique, intra-articular shoulder pathology treatment can be performed in a more accurate biomechanical and physiological scenario. It avoids many visualization and instrumentation inconveniences, as well as the risk of some major complications. Joint distension with fluid becomes unnecessary, making it possible to use medium-sized incisions to perform and simplify complex procedures.

A plethora of shoulder pathologies can be treated by arthroscopic techniques. A distended joint full of water is considered essential to perform them. However, the presence of fluid during arthroscopy is linked to different types of inconveniences. Accurate visualization can be lost because of turbulence or turbidity. In addition, many times, instrumentation steps are made difficult by continuous water inflow during long interventions; soft-tissue swelling may result not only in portal shifting and obliteration but also in unpleasant changes in the shape and volume of the shoulder, making it almost impossible to perform any associated mini-open surgical steps.

Continuous positive pressure applied to the glenohumeral joint is not without risks. Fulminant air embolism and other severe complications have been described not only during air arthroscopy, which uses gas inflow instead of water, but also with traditional fluid arthroscopy. When the joint is in its most physiological and biomechanical environment, it is not under any type of positive pressure, which suggests that pressure-free arthroscopic exploration and treatment probably comprise the ideal scenario during surgery.

Technique

All patients were placed in the beach-chair position. No traction was applied. A standard posterior glenohumeral viewing portal was created first as in the classic technique. The anterior portal was then established under dry arthroscopic vision. Additional portals were created as necessary.

Once the initial portals were created, any synovial fluid or hemarthrosis, if present, was washed and simultaneously aspirated with a synoviotome suction pump. A free arthroscopic sheath side valve (not connected and/or used for inflow or outflow) was left open during surgery (except when the joint was washed). An open valve prevented the joint from collapsing and increased bleeding caused by negative pressure during suction and from local increased heat due to shaving or burring.

Joint exploration was performed just like in the classic wet method. Dynamic assessment of the shoulder was performed routinely. Once the pathology was recognized (synovitis, labral lesions, glenoid defects, and so on), the appropriate instrumentation techniques were applied with no significant variation from the traditional method (Fig 1; Video 1). No special equipment was used.

In most cases hemostatic thermal probing was unnecessary because active bleeding, if present, occurred with slow leakage over the capsule into the axillary recess.
without compromising visualization, whereas hemo-
stasis occurred spontaneously (Fig 2). In those cases in
which thermal probing hemostasis was required, a few
intermittent shots were sufficient to stop the bleeding. No
thermal tissue ablation or dissection was required at any
time.

Sometimes the arthroscope clouded over or became
stained, and in such cases injecting a few milliliters of
air or saline solution with a syringe through the
sheath’s side valve or even just rubbing the tip of the
lens against any intra-articular soft tissue was sufficient
to promptly recover adequate visualization.

During bone socket creation (e.g., for further anchor
or screw insertion), blood splashing may compromise
the view; to avoid this, we transiently retrieved the lens
as far as possible while still keeping fine visualization.
This maneuver was also very useful when inserting
anchors with a mallet.

The glenohumeral joint was sporadically washed with
saline solution (and immediately aspirated until a dry
scenario was again achieved). This was sometimes
necessary after using certain instruments such as ring
curettes and rasps or when too many blood clots
mounted up in the axillary recess.

**Discussion**

Classic “wet” arthroscopy has been universally ac-
cepted as the gold-standard technique for shoulder
arthroscopic surgery. A great number of pathologies
can be recognized and treated successfully by the classic
technique. Moreover, many pathologic entities ignored
in the past have been found using this method.

Gas (i.e., air, carbon dioxide, nitrous oxide, or
oxygen) was the first intra-articular medium used to
perform arthroscopy since the initial description of the
procedure by Bircher\(^6\) in 1921. However, decades later,
this medium for visualization was abandoned and
changed to liquid, mostly because of increasing reports
of severe and even lethal complications.\(^2\) The problem

![Fig 1. Dry arthroscopic anterior Bankart repair of a right shoulder viewed through posterior viewing portal. Note how (A) glenoid bone bed preparation, (B and C) tissue and suture management, and (D) knot tying are performed just as in the classic wet method.](image1)

![Fig 2. Right shoulder viewed through posterior viewing portal. (A) Dry arthroscopic view of synovitis on anterior glenohumeral capsule. (B) After synovectomy with the power shaver, vision is not compromised despite transient capsular bleeding.](image2)
was not the gas itself but was a joint distended by a positive pressure inflow of the gas.

Performing traditional arthroscopy is not without inconveniences. Imbalance between inflow and outflow, associated with the free egress of fluid through portals, often results in turbulence and loss of visualization. Even a few seconds of imperceptible bleeding can compromise vision because of turbidity in a water-full cavity. To avoid this problem, many surgeons lower patients’ intraoperative blood pressure, which has some serious potential risks such as cerebral hypoperfusion. Surgeons also try to prevent arthroscopic intraoperative bleeding by avoiding the use of certain important surgical instruments (such as elevators, rasps, ring curettes, and power shavers) and instead using a thermal probe. As a result, local vascularity and soft-tissue and cartilage quality are sometimes jeopardized because of excessive heat. Dry arthroscopy of the shoulder solved all these difficulties.

Dry arthroscopy sets aside all concerns about intra-articular fluid management and pressure, and thanks to the lack of tissue infiltration, the volume and contour of the shoulder are preserved during surgery. With this novel arthroscopic approach, surgeons may perform and take advantage of larger portals (even regular incisions) and thus possibly expand the scope of shoulder arthroscopic treatments; an example of this would be simplifying some complex procedures (and hence making them reproducible and safe), such as intra-articular osteosynthesis and osteotomies, as well as bone grafting large glenoid or humeral head defects, all with arthroscopic assistance (Fig 3).

Another great advantage of dry arthroscopy is the possibility to assess lesions in their natural scenario. For instance, multidirectional instability can be evaluated much more realistically before and during instrumenta-
tion because no distending intra-articular force alters the real biomechanical environment. The same situation is

### Table 1. Advantages and Pitfalls of Dry Arthroscopy of Shoulder

| Advantages | Pitfalls |
|------------|----------|
| Assessment and treatment of lesions in their natural, real scenario | Field of vision might occasionally be less clear and/or spacious |
| Preservation of shoulder shape, volume, and external anatomic landmarks during surgery | Probably inadequate if sustained use of thermal probe or radiofrequency is desired |
| Prevents portal shifting and/or obliteration | |
| Allows mini-open incisions and complex arthroscopic procedures to be performed | |
| Less need for thermal probe and radiofrequency use | |
applicable to labral lesions, biceps lesions, internal impingement, and many other pathologic entities.

A potential limitation of the dry arthroscopy technique is that vision, though adequate, might occasionally not be as clear and/or spacious as in the classic method. In addition, a dry intra-articular setting would not be advisable if sustained use of a thermal probe or radiofrequency is desired because of the excessive heat (Table 1).

On the basis of the experience of dry arthroscopy of the wrist, it was possible to go further and explore, diagnose, and treat intra-articular shoulder pathologies using a dry technique, which did not require additional skills and avoided many of the difficulties of the classic wet method. Most importantly, it allowed us to work in a much more physiological environment.

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