

## Short Communication

# Washing Out the Septic Knee

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Effective drainage of joint purulence is a key component of the management of the septic knee. Methods from arthrocentesis to open arthrotomy and arthroscopy are mainstays, with different efficacies and morbidities. Percutaneous tube instillation techniques have been employed since World War I. Methods to effect joint distension and irrigation to mimic what is accomplished at arthroscopy employed over the past 65 years have been honed to a simple bedside technique since the 80s and applied successfully in management of several different arthritides, including septic arthritis. Wider employment of this technique has the potential to more effectively treat the septic knee, particularly when access to O.R. based procedures is limited, as well as allow usage by physicians who do not perform arthroscopy.

**INTRODUCTION**

The time-honored principles in acute septic arthritis management involve the prompt and thorough drainage of joint purulence possible [1,2]. The benefits of the washout have been displayed in the lab from reports of a lapine model of septic arthritis which displayed reduced cartilage loss among animals whose infected knees were washed out [3]. In the development stages of surgical arthroscopy, it became evident that the procedure would attain similar goals as the more invasive open arthrotomy [4,5]. Additionally, the more benign outcome achieved through arthroscopy was bolstered by a review of NHS data [6]. However, it has never been established that joint drainage beyond arthrocentesis confers superior outcomes, at least as can be shown in retrospective reviews. The first large review to show this was undertaken early in the modern arthroscopic era, and for most patients surgical drainage meant open arthrotomy [7]. Morbidities associated with healing an arthrotomy likely detracted from any satisfactory outcome. But more recent reviews, in which almost all surgical drainage involved arthroscopy, showed the same phenomenon [8, 9]. Nevertheless, in recent times, using quick arthroscopic washout of a septic knee is viewed and adopted as standard care [6]. How often the intervention is adopted [10, 11], and if it happens at all [12,13] remains an issue for discussion. With decreasing levels of anesthesia and increased performance of arthroscopy in an office or procedure room compared to when it was strictly in an operating room procedure, barriers to employment of arthroscopy have been steadily reduced. Reengineering of small-bore needle arthroscopes to produce instruments which show images equivalent to those from conventional glass lens arthroscopes [14], have made in-office arthroscopy not only feasible but attractive. Recently, Stornebrink and colleagues described a series of patients whose septic knees were managed

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with a needle arthroscope at the bedside – a procedure in which much less fluid washes through the joint than with O.R.-based arthroscopy – and achieved uniformly satisfactory outcomes [15], extending it to a larger group of patients with other infected joints and finding similar results [16]. But the arthroscope may not be necessary at all to wash out of the septic knee.

**METHODS**

Search of the literature using Web of Science, Scopus, and PubMed using terms “Septic arthritis” or “Infectious arthritis” and “Lavage” or “Irrigation” or “Drainage” or “Washout” or “Arthroscopy” generated references not already in the author’s library.

**DISCUSSION**

It is not always possible to arthroscope the septic knee. During the COVID pandemic, the British Orthopedic Association (BOAST) issued guidelines that medical treatment composed of closed-needle aspiration and antibiotic therapy needed to be given to patients as first-line management. The operative treatment that involved arthroscopic joint washout +/- synovectomy was reserved for patients with sepsis signs, thus effectively reducing the exposure of infected patients to the O.R. environment [17]. Countries and communities with limited resources do not have the privileges of taking quick trips to O.R. for arthroscopic washout, as they lack multiple facets of orthopedic service, including arthroscopic expertise [18]. Even in developed countries, an orthopedist capable of performing arthroscopy may not always be readily available to help manage a patient with a septic knee. With a looming shortage of orthopedists [19], this problem could become more common.

Before the widespread use of arthroscopy, different

techniques to wash out the septic joint had been addressed. During the First World War, carbolic acid, magnesium sulfate solution or boric acid was reported to be effective even before the discovery of antibiotics, let alone arthroscopy [20]. The intra-articular tube installation was developed to deliver antibiotics and detergents and was consistently effective [21]. In this regard, Bob Jackson recognized the inherent limitations to the technique; thus, he incorporated slow distension of the joint regulated by the patient together with cycled evacuation to suction that continued for 8 to 10 days [22]. In this case, the results were highly effective compared to those treated with “drip drain”; thus, Jackson described it as a highly effective strategy for synovial purulence removal. There has been a description of other methods to enhance drainage of the infected joints without the need to use conventional surgical methods. These include the placement of a continuous irrigation tube in a septic knee employing reduced arthroscopic guidance [23], and the use of an irrigating catheter (into septic hips) under radiographic guidance and general anesthesia [24]. Additionally, there is the fluoroscopic guidance of a pigtail catheter method that is attached to enhance the low-suction reservoir [25]. The different strategies have not attained widespread acceptance as adjunctive measures to improve the effective management of septic arthritis.

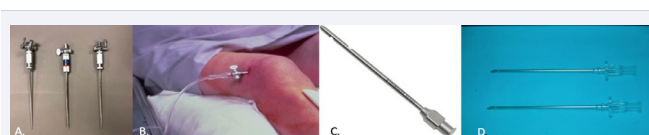
Bob Jackson published the first description of arthroscopy to manage and treat septic knees. The publication covered no longer pursued practices such as prolonged post-op suction drainage and inclusion of a detergent [26]. A recent analysis of management of the septic knee does not mention adjunctive interventions but describes the arthroscopy and washout [4].

A number of different interventions have been described to approach the septic knees of children and medically unstable patients and are characterized by puncture of the joints and flow-through of irrigant as in the case of joint washout [27]. These are described in detail elsewhere [28]. Bob Jackson’s teacher, the father of modern arthroscopy Makei Watanabe, devised a technique to duplicate the washout effect that accompanies arthroscopy [29]. Named “articular pumping”, saline was pumped into the knee then evacuated until 1-3 liters had passed through the joint. The technique has been applied by many since, with promising results in a number of different arthritides, including septic arthritis [30].

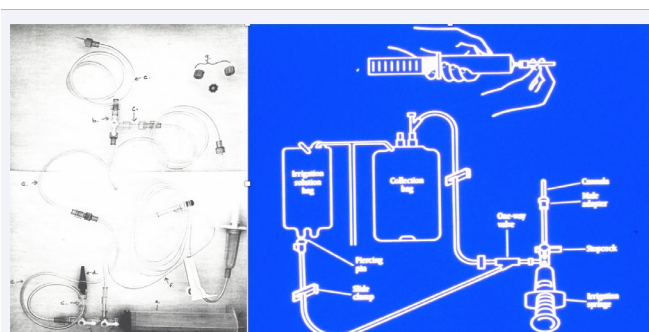
Joint washout is an important intervention for septic arthritis regardless of the technique or approach adopted. The details of the procedure performance that include volume and type of washout fluid, post-lavage and additives remain to be addressed, and their difference is dependent on the clinical scenario. Washout can be accomplished without the challenges associated with access, expertise and costs that govern arthroscopy-based procedures. Using this procedure in countries with limited resources where the barriers are factual and high could improve the management of septic arthritis in these regions [31]. Realize that avoidance of amputation constitutes victory of septic arthritis treatment in areas with limited resources [32].

## PERFORMING JOINT WASHOUT

Bedside joint washout can be accomplished by any physician who can tap a knee [33]. Washout can be performed with 2 cannulae, as in France [34], or by the single-entry method – once called “tidal irrigation” - I have always employed since learning it from my mentor, Bill Arnold [35]. We believe this provides a more thorough washout as inflowed fluid cannot exit out a pressure gradient before filling the joint and the instillation causes some capsular distension. Initial steps are same as those for arthrocentesis: a comfortably supine patient, appropriate skin anesthesia (with some extra infiltrated in anticipation of a larger bore needle), joint penetration with removal of any fluid, followed by intraarticular instillation through same needle of 10 ml bupivacaine. After this, things become more specialized. A needle of around 14 gauge [2mm] – whether a Vere’s needle, sterilized cow teat cannula, or plain 14 g needle (Figure 1) – is used to penetrate the joint. The hub of the needle is connected to the male end of the tube of the assembly that will convey washout fluid in to and out of the joint (Figure 2). 30 – 60 ml fluid is instilled into the joint, 3-way stopcocks then adjusted to direct effluent to a tube connected to a collection bag or suction. The process is repeated until the infusion bag is empty, whether starting at 1 L or 3 L. The entire process takes about 30 minutes. Glucocorticoid or hyaluronate can be instilled as desired if dealing with osteoarthritis or a non-infectious inflammatory arthropathy. A Steri-Strip is adequate for closure and the patient is immediately ambulatory, with the usual instructions regarding post-injection activity [36]. In the United States, no specific billing



**Figure 1** Technique of joint washout I. Needles. A. 14 g Verres needle, 3 different brands. B. Knee being washed out through Verres needle connected to irrigation tubing. 30-60 mL aliquots of saline are instilled into joint, then removed and repeated until at least a liter passes through. C. cow teat cannula, 14 g, suitable for use as washout needle. D. 2 mm cannulae favored by French rheumatologists (courtesy of X. Ayral, Paris). Reproduced from reference [32], with permission.



**Figure 2** Technique of joint washout. Fluid connections. A. “homemade” kit, utilizing off-the-shelf items. a. 60 cc syringe, b. 3 way stopcock, c. double male luer adapter, d. “Christmas tree” adapter, e. connecting tubing, f. bag spike with macrodrinker and tubing, g. screw caps. B. “Tidal irrigation” kit developed and vended by Abbott Labs (Abbott Park, IL), used in trial described in ref 22, no longer sold). Reproduced from reference [32], with permission.

code exists for washout, so billing is submitted for “miscellaneous knee procedure” with documentation.

## CONCLUSION

The simple and safe technique of bedside knee washout can be applied as a method to drain joint purulence in the septic knee and could supplant more extensive drainage procedures and substitute for them where for various factors they may not be available. Described 30 years ago [37], it has not yet caught on. Perhaps it's time is finally near.

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