

Why would a Rheumatologist want to Wield an Arthroscope?

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Abstract

The arthroscope is not generally considered a tool of the rheumatologist, even though some rheumatologists have been involved with arthroscopy since the very early days of the development of the technique. The arthroscope is an excellent tool for assessment of the synovium, upon which rheumatologists are focusing ever more of their attention, even to the point of tailoring therapies based on specific synovial characteristics. Clinical improvements have been described following non-operative arthroscopy in several different arthritides. Newly available small-bore arthroscopes suitable for use in an office setting offer an opportunity for rheumatologists to explore uses of the 'scope in their disorders away from any potential conflict with their operating room based orthopedic colleagues.

Keywords: *Rheumatologist; Arthroscope; Osteoarthritis*

Perspective

The first book on arthroscopy was published by a German rheumatologist [1]. The father of modern arthroscopy - Watanabe - counted a number of rheumatologists among his students who took the skill to their home countries and taught others, including orthopedists [2-6]. With development of video display of the arthroscopic image [7] plus motorized equipment to effect tissue removal [8], arthroscopy became a more accessible procedure, drawing interest of many orthopedists but some rheumatologists as well. Arthroscopy guided interventions developed to address osteoarthritis [10] and refractory synovitis [11,12] were applied by some rheumatologists. The first prospective trial examining the effect of arthroscopic surgery in knee osteoarthritis was conducted by rheumatologists [13] joined 9 years later by a larger trial which also showed no benefit of surgery beyond sham [14] a finding many subsequent trails would confirm [15]. Absent an effect for arthroscopy in OA and seeing refractory synovitis become much less common with wider use of biologic agents, American rheumatologists lost interest in arthroscopy and activity ceased by the first decade of this century. Interest in arthroscopy as a research tool persisted in Europe, Asia, and Australia, with several centers still active and productive [16,17].

Arthropathies drawing the most attention from rheumatologists are those in which the synovium plays an important role, particularly those primary disorders in which an autoimmune process has triggered synovitis, like rheumatoid arthritis, psoriatic arthritis, spondyloarthropathies, and others. Not all conditions characterized by synovitis present in a manner that lends a ready diagnosis. For those, a look at the synovium and taking of a sample can guide diagnosis [18]. Most synovial disorders do not elaborate characteristic macroscopic or microscopic features. But there are some diagnoses where this is indeed the case (Table 1). The strong research focus on the synovium over the past 2 decades has produced powerful molecular tools to extract information from synovium [19] to the point where choice of therapy can be based on synovial features and the response to that therapy judged by synovial changes [20]. True "precision medicine" is at hand, and the arthroscope will be an important tool in applying such treatment [21]. Ultrasound-guided synovial biopsies have become popular for this purpose [22] but lack several attributes which make arthroscopy a preferable approach: selecting biopsy sites from several areas

of the joint and based on macroscopic characteristic, providing a larger volume of tissue, and including a washout effect, which can be therapeutic in inflammatory arthropathies [23]. With tolerance of the procedure and post-procedure complications no different between US- guided and arthroscopic biopsies [24], the justification for US-guided biopsies becomes only that of operator’s skill, the US-guide procedure being easier to master than arthroscopy. Recent availability of small-bore image enhanced ‘scopes suitable for office use help ease barriers to application of arthroscopy by rheumatologists (Figure 1). Orthopedists are also beginning to take notice of the applicability of these scopes to scenarios they face [25].

Diagnosis	Macroscopic Features	Microscopic Features
Crystalline diseases		
Calcium pyrophosphate disease	Calcific deposits	Calcium pyrophosphate crystals
Gout	Refractile urate deposits	Monosodium urate crystals
Hydroxyapatite arthropathy	Calcific deposits	Hydroxyapatite crystals (electronmicroscopy): globular calcium containing deposits (Von Kossa, Alizarin S stains)
Infectious arthritis		
Bacterial and fungal	Adhesions, necrotic synovium, cartilagediscoloration	Organisms; intense polymorphonuclearinfiltrate
Chronic borreliosis (Lyme disease)	Hypertrophic synovium	<i>Borrelia burgdorferi</i> spirochete (silverstain)
Filariasis	Guinea worm	---
Tuberculosis	---	Caseating granulomata with acid-fastbacilli
Infiltrative diseases		
Amyloidosis	---	Amyloid deposition (Congo red stain)
Fabry’s disease	---	Foam cells in vessel walls
Inflammatory arthropathies		
Behçet’s disease	Synovial “slough”, avascular, fibrinoid membranes, erythematoid synovitis without villi	---
Postvenereal reactive	---	Chlamydia bodies, Yersinia antigens (with special immunofluorescent agents)
Psoriatic arthritis	Tortuous synovial vessel	---
Systemic lupus erythematosus	---	Hematoxylin bodies
Malignancy		
Primary (eg, synovioma) or metastatic, leukemia, lymphoma	---	Malignant cells
Metabolic arthropathies		
Hemochromatosis	---	Blue hue predominantly of synovial lining cells (due to iron depositis)
Ochronosis	Black pigment, shards	Fragments of pigmented cartilage
Synovial disorders		
Pigmented villonodular synovitis	(As name describes)	---
Synovial chondromatosis	Cartilage in synovium	Islands of metaplastic cartilage
Other		
Hemangioma	---	Excessive (often irregular or cavernous) blood vessels
Foreign body (eg, plant thorn)	---	Birefringent plant material; granulomatous reaction
Multicentric reticulohistiocytosis	---	Histiocytes and multinucleated giant cells
Sarcoidosis	---	Noncaseating granulomata
Whipple’s disease	---	Periodic-acid-Schiff-positive, diastase- resistant macrophages

Table 1: Characteristic features of synovium in selected rheumatic diseases. Reproduced from reference 38, with permission.

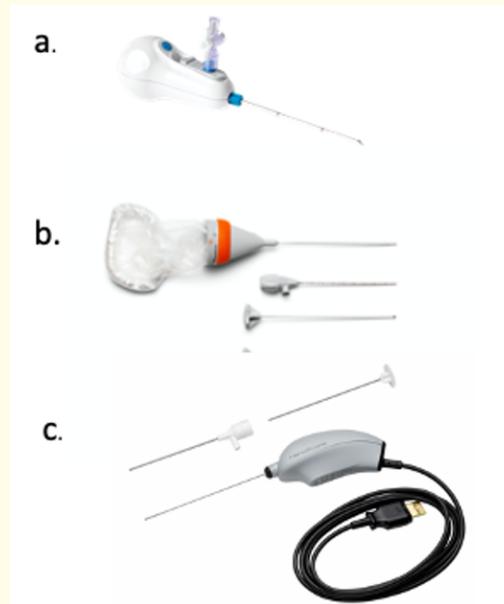


Figure 1: Needle arthroscopes for in-office use. a. MiEye 2 (Trice Medical, Malvern PA). 1.9 mm disposable scope and camera with 2.2 mm inflow cannula and 120° field of view. <https://tricemedical.com/mi-eye/>. b. VisionScope (VisionScope Technologies, Littleton MA) 1.4 mm reusable scope available in 4 lengths (60mm, 95mm, 125mm, and 160mm). Utilizes 1.9 mm disposable cannula and reusable camera (not pictured). <https://visionscope-tech.com/>. c. NanoScope (Arthrex, Inc. Naples FL) 1.9 mm disposable scope and camera with 2.2 mm inflow cannula and 1200 field of view. <https://www.arthrex.com/what-surgeons-are-talking-about/78CC3845-4F4A-4F8A-A867-016B995DFC52>. Instruments for use with the Nanoscope have been developed (<https://www.arthrex.com/knee/nano-arthroscopic-instruments>). Images of arthroscopes obtained directly from their respective manufacturers, who also granted permission to use the images in this publication. Reproduced from reference 17, with permission.

In many arthropathies presenting to the rheumatologist, the synovium is reacting to something specific, from the crystals shed after being deposited by metabolic processes, to the cartilage fragments sloughed from degenerating joints surfaces in osteoarthritis, to the rare cases from infectious agents. In each situation, an arthroscope can help with management. The first American arthroscopic surgeons observed that patients with deposits did well after arthroscopy [26,27]. Medical management of such patients focuses on blunting synovial response to crystals but removing the irritant could be helpful in the difficult case. The role of arthroscopy on management of osteoarthritis has been the focus of many studies [28]. The days of arthroscoping such patients to identify the ubiquitous “internal derangements” and resecting them have been put to rest, but there remains the effect of the washout accompanying the procedure. Despite the seeming death sentence to this intervention delivered by a prospective controlled study comparing washout to sham [29], sham was an intervention with its own effects [30], making the study questionable. Data accumulated since suggests washout is still worth considering for knee OA [31]. Arthroscopy has shown that a considerable portion of patients with knee OA undergoing arthroscopic washout have visible calcinosis, not suggested by x-rays or synovial fluid studies [32]. Such patients tend to have a better response to washout than patients without calcinosis [33,34]. What all this calcinosis means is an area the arthroscope is ripe to explore.

Septic arthritis is a medical emergency for which urgent and thorough drainage of joint purulence is indicated [35]. Circumstances can influence whether that quick trip to the OR for an arthroscopic washout can actually occur. For example, in the UK during the COVID pandemic, British Orthopaedic Association (BOAST) guidelines dictated that medical treatment (closed-needle aspiration + antibiotic

therapy) should be offered to patients as first-line management, and operative treatment (arthroscopic joint washout +/- synovectomy) be reserved for patients exhibiting signs of sepsis, reducing the exposure of infected patients to the O.R. environment [36]. The quick trip to the O.R. for arthroscopic washout is often not an option in communities and countries where resources are limited and/or arthroscopic expertise is not available [37]. Mini arthroscopy with washout provided in an office or procedure room setting would remove many of these barriers.

Conclusion

It is these applications of arthroscopy rheumatologists seek. Note that none involve therapeutic tissue resection. None venture anywhere near an operating room and rheumatologists will clearly own their own equipment. There is no turf to be discussed anywhere. So, if a rheumatologist emerges at your institution expressing an interest in arthroscopy, encourage him/her. Good things will happen, and no patients will be stolen. Maybe he/she will even show you how you can use this technique in your office.

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