Arthroscopy of the wrist joint: Setup, instrumentation, anatomy & indications

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Aims of the lesson

Setup, portals and instrumentation

Surgical technique

Arthroscopic anatomy

Indications

Basic arthroscopic procedures

Beneficial role of arthroscopy in wrist disorders
Historical preview

First wrist arthroscopy has described by Chen in 1979

In 1988 Roth et al. presented an “Instructional Course Lecture” on wrist arthroscopy at AAOS


With the ever-expanding list of indications and procedures that can be performed with this technique, it exists as an essential diagnostic and therapeutic tool for the orthopaedic surgeon.
Set up

Patient supine

*General/regional anaesthesia*

Tourniquet (250 mm Hg)

Finger traps

5+ Kg weight

tower / suspension system

Gravity fed inflow
Wrist distraction is necessary to create adequate space for introduction of instruments.
- lidocaine with epinephrine
- 30 to 50 min wait before surgery
- 20 ml to block the sensory branches of radial, ulnar, and PI nerves.
- additional 5 mL into the radiocarpal joint
Prep & drape

un-dyed prep solution
sterile finger traps (multi-use)
waterproof drapes
top sterile drape
Basic instrumentation

marking pen
15 blade
20 ml syringe
green needles
small straight clip
2.5mm, 30° small joint scope
probe (1.5mm tip)
Portals

Dorsal
1-2, 3-4, 4-5, 6R, 6U, DRJU

Midcarpal
MCR, MCU, STT

Volar
VR, VU, DRUJ
Dorsal portals

Main working portals
3-4: 1 cm distal to Lister’s tubercle
6R: radial to the ECU tendon

Midcarpal
MCR: 1 cm distal to the 3-4 portal
MCU: 1 cm distal to the 4-5 portal

DRUJ: Forearm supinated, between radius and ulna underneath the TFCC
Volar portals

VR portal:
- Dorsal Radiocarpal ligament (DRCL) and volar part of Scapholunate ligament (SCL)
- Arthroscopic reduction of intra-articular fractures of the distal radius fractures (dorsal rim fragments)

- 2 cm incision over the FCR at the proximal crease of the wrist

The median nerve lies 8 mm ulnar to the VR portal & the palmar cutaneous branch 4 mm but always ulnar to the FCR
Volar portals

VU portal
- more technically demanding
- volar tears of the lunotriquetral ligament (LTT)
- repair or debridement of dorsal TFC tears

- 2 cm incision over the finger flexor tendons centered at the proximal wrist crease

ulnar nerve and artery are usually more than 5 mm apart from the portal
The box concept
Surgical technique

18-gauge needle is inserted first & angled 10° volar

Joint distention with 5 to 7 mL of NS

Skin incision only

Blunt dissection with forceps

Arthroscope insertion, blunt trocar
Surgical technique

establishment of 6R portal

Trans-illumination technique

introduction of the needle radial to ECU and distal to the TFCC
Arthroscopic anatomy - radiocarpal
Arthroscopic anatomy - midcarpal
Diagnostic arthroscopy

Systematic approach

Viewing of all chondral surfaces and ligamentous structures

Debridement of tissues to improve visualization

Disease specific instrumentation and approach
Indications

- diagnostic arthroscopy
- “ectomy” procedures
- tissue shrinkage
- surgical release
- repair procedures
- reconstructive procedures

For soft tissue or bone pathology
Wrist pain of unknown origin
Synovial biopsy

Assessment of instability
**Staging (Kienböck’s disease)**

- diagnostic arthroscopy
- “ectomy” procedures
- tissue shrinkage
- surgical release
- repair procedures
- reconstructive procedures
Diagnostic arthroscopy

“ectomy” procedures

Tissue shrinkage

Surgical release

Repair procedures

Reconstructive procedures

Dorsal and volar ganglia
Intraosseous ligaments
Synovectomy
TFCC tears

Articular cartilage lesions
Scaphoid, Hamate, Lunate, Pisiform
Distal ulnar (wafer procedure)
Proximal-row carpectomy
Ulnar styloid
Capsule or **ligament shrinkage**

Volar capsular release  
Dorsal capsular release

- diagnostisch arthroscopy
- “ectomy” procedures
- tissue shrinkage
- surgical release
- repair procedures
- reconstructive procedures
- Diagnostic arthroscopy
- "Ectomy" procedures
- Tissue shrinkage
- Surgical release
- Repair procedures
- Reconstructive procedures

Dorsal radiocarpal ligament
Lunotriquetral instability
Scapholunate instability
TFCC suture

**Distal radius fractures**
Peri-lunate dislocation
Scaphoid fractures
Scapholunate instability
Scapholunate ligament reconstruction
Distal radioulnar joint stabilization

- Diagnostic arthroscopy
- "Ectomy" procedures
- Tissue shrinkage
- Surgical release
- Repair procedures
- Reconstructive procedures

Bone graft to scaphoid nonunion
Limited wrist fusion
Full wrist fusion
Common simple? procedures

- Assessment of instability
- TFCC Tears
- Radial Styloidectomy
- Wafer Resection (distal ulna)
- Release of Wrist Contractures
- Staging of Kienböck’s disease
- Arthroscopic Assisted Fixation
- of fractures (distal radius and scaphoid)
TFCC tears

- debridement
- inside-out repair
  (type 1B- 1C lesions)
# Palmer classification

<table>
<thead>
<tr>
<th>Type of Tear</th>
<th>Description of Tear</th>
<th>Authors’ Management</th>
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</thead>
<tbody>
<tr>
<td><strong>Traumatic</strong></td>
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<tr>
<td>1A</td>
<td>Tear in horizontal or central portion of disk, often with an unstable flap</td>
<td>Initial splinting with or without steroid injection; arthroscopic debridement of central torn portion</td>
</tr>
<tr>
<td>1B</td>
<td>Tear from distal ulna insertion with or without ulnar styloid fracture</td>
<td>Arthroscopic repair; inside-out technique; with or without ECU sheath open repair</td>
</tr>
<tr>
<td>1C</td>
<td>Tear with ulnocarpal ligaments disrupted (ulnolunate and ulnotriquetral ligaments)</td>
<td>Arthroscopic-augmented repair by use of a mini-open approach with or without FCU augmentation</td>
</tr>
<tr>
<td>1D</td>
<td>Tear from insertion at radius</td>
<td>Debridement of torn portion or reattachment to sigmoid notch</td>
</tr>
<tr>
<td><strong>Degenerative</strong></td>
<td></td>
<td></td>
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<tr>
<td>2A</td>
<td>TFCC wear but no perforation</td>
<td>Diagnostic arthroscopy followed by open diaphyseal ulna shortening</td>
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<tr>
<td>2B</td>
<td>TFCC wear but no perforation Chondromalacia of lunate or ulnar head</td>
<td>Arthroscopic TFCC debridement plus arthroscopic wafer procedure or open diaphyseal ulna shortening</td>
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<tr>
<td>2C</td>
<td>Central perforation of TFCC Chondromalacia of lunate or ulnar head</td>
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<td>2D</td>
<td>Central perforation of TFCC Chondromalacia of lunate or ulnar head Perforation of LT ligament</td>
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<tr>
<td>2E</td>
<td>Central perforation of TFCC Perforation of LT ligament Ulnocarpal arthritis</td>
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Abbreviations: FCU, flexor carpi ulnaris; LT, lunotriquetral.
Radial styloidectomy

Impingement due to scaphoid nonunion or SCL dissociation

1-2, VR, and 3-4 portals

Up to 4 mm of resection (ulnar translocation of the carpus)
Wafer Resection of the Distal Ulna

ulna impaction syndrome
**triad** of LT ligament tear, a TFCC tear and neutral or ulnar positive variance

4-5, 6R and 6U portals

2.9 mm burr is used to resect 2–3 mm of the ulnar head
Release of Wrist Contractures

Volar capsulotomies to regain wrist extension

Dorsal capsulotomies for wrist flexion but they may require use of a volar arthroscopy and are technically more difficult.
Staging of Kienböck’s disease

**grade 0:** extra-articular procedure, (joint-leveling procedure or lunate revascularization)

**grade 1 or 2a:** radio-scapho-lunate fusion

**grade 2b:** proximal-row carpectomy

**grade 3 or 4:** salvage procedures (wrist arthrodesis or arthroplasty)
Assisted fixation of fractures

superior to fluoroscopy and x-rays, need for KW and ex-fix

superior clinical outcomes, better range of motion and improved radiologic variables

Preferable today fixed-angled plates, (arthroscopy can assess possible screw penetration)

Best indication: 2-part radial styloid fractures reduction and assessment of SCL
Complications

Uncommon (reporting rates 2%)
Most related to the size of instrumentation
Care with creation of portals
EPL is the tendon most at risk
Nerve damage

Infections
Reflex sympathetic dystrophy
Irritation from implanted material
Skin lacerations on finger traps
How beneficial wrist arthroscopy is?

- Retrospective review of 125 patients with wrist pathology
- Correlation of clinical and radiological diagnosis with arthroscopic findings
- Investigation of how beneficial was the arthroscopic procedure for either diagnostic or therapeutic purposes

**Group I**
- preoperative clinical and/or radiological diagnosis
- **arthroscopy for** Confirmation, therapeutic purposes

**Group II**
- normal physical or radiological findings
- **arthroscopy for** Diagnostic purposes

**Group III**
- established diagnosis
- **arthroscopy for** Staging, preop planning
Material-Methods

- 125 consecutive wrist arthroscopies
- Seven year period (2004-2011)
- 49 male, 76 female
- Mean age at operation 38 years (range 17-64 years)
- 57 patients (45.6%) had a documented previous injury
- 320 conventional diagnostic tests and 456 imagine studies!

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<th>Group</th>
<th>Description</th>
<th>Patients</th>
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<tr>
<td>Group I</td>
<td>preoperative clinical and/or radiological diagnosis</td>
<td>94 patients (75.2%)</td>
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<tr>
<td>Group II</td>
<td>Pain, but normal physical or radiological findings</td>
<td>12 patients</td>
</tr>
<tr>
<td>Group III</td>
<td>established diagnosis</td>
<td>19 patients</td>
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</table>
How beneficial the arthroscopy was...

- **Group I**: when the pre-operative diagnosis was changed, excluded or limited in such a way that the management was changed.

- **Group II**: when a diagnosis was established (valuable when an intra-articular pathology corresponded to the patient symptoms).

- **Group III**: when the pre-operative planning was changed.
Results

- **Group I**: Arthroscopy was beneficial in 51/94 patients (54%) from whom the pre-operative diagnosis was changed or augmented sufficiently to alter subsequent management.

- **Group II**: A beneficial arthroscopy establishing a definitive diagnosis was conducted for 9/12 patients (75%)

- **Group III**: Arthroscopy was of benefit to 14/19 patients (74%) for whom the subsequent definite management plan was modified.

- For all groups, arthroscopy was deemed of benefit when a therapeutic intervention was successfully conducted, independently of the ultimate outcome. There were 66/125 (53%) such patients.
Speculations...

- **9/12 (25%)** of the patients in Group II (no diagnosis) had a normal arthroscopic appearance (9.4 investigations per patient!!!)
  - work compensation, malingering, simulation?
  - undiagnosed chronic wrist pain?

- **31/51 (61%)** arthroscopies in Group I revealed significant unsuspected intra-articular pathology
  - unrelated to the clinical findings or misdiagnosed?
Conclusions

- Wrist arthroscopy is a useful diagnostic and therapeutic tool in the management of wrist disorders.
- A thorough clinical examination is still the best way to reach the diagnosis.
- Correlation of the unexpected arthroscopic findings with the symptoms of the patient to avoid over-treatment.
- Useful in preoperative planning when a diagnosis is already exist.
- Further advances are likely to occur from adapting open reconstructive procedures into an arthroscopic model.