

Puncture Capsulotomy for Hip Arthroscopy

A Report of Two-Year Functional Outcomes

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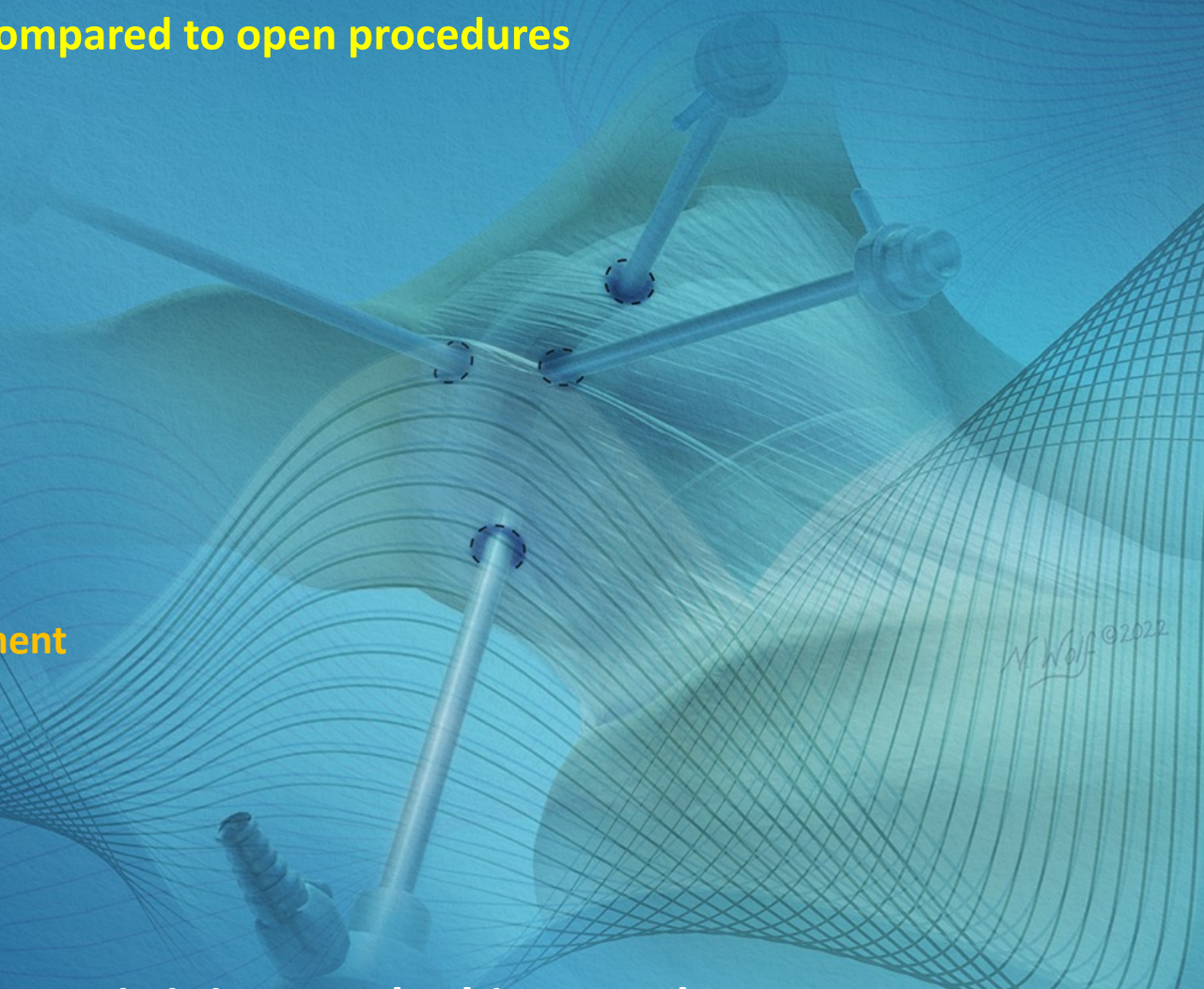
I (and/or my co-authors) have nothing to disclose directly related to this talk.

I have no conflicts



Introduction

- **Femoroacetabular impingement (FAI)**
 - **Hip arthroscopy now standard treatment compared to open procedures**
 - **Faster post-operative recovery**
 - **Fewer complications**
 - **Reduced morbidity with similar efficacy**
- **Arthroscopic techniques developed**
 - **Enhance surgical field visualization**
 - **Minimize iatrogenic hip instability**
 - **Optimize patient outcomes**
- **Interportal, T-capsulotomy**
 - **Iatrogenic capsuloligamentous instability**
 - **Transection of the iliofemoral capsule ligament**
 - **Implicated in**
 - Dislocation
 - Postoperative pain
 - Micro-instability
 - Heterotopic ossification
 - Seroma formation
- **Need for a surgical approach to avoid iatrogenic injury to the hip capsule**
 - **While demonstrating improved functional outcomes**

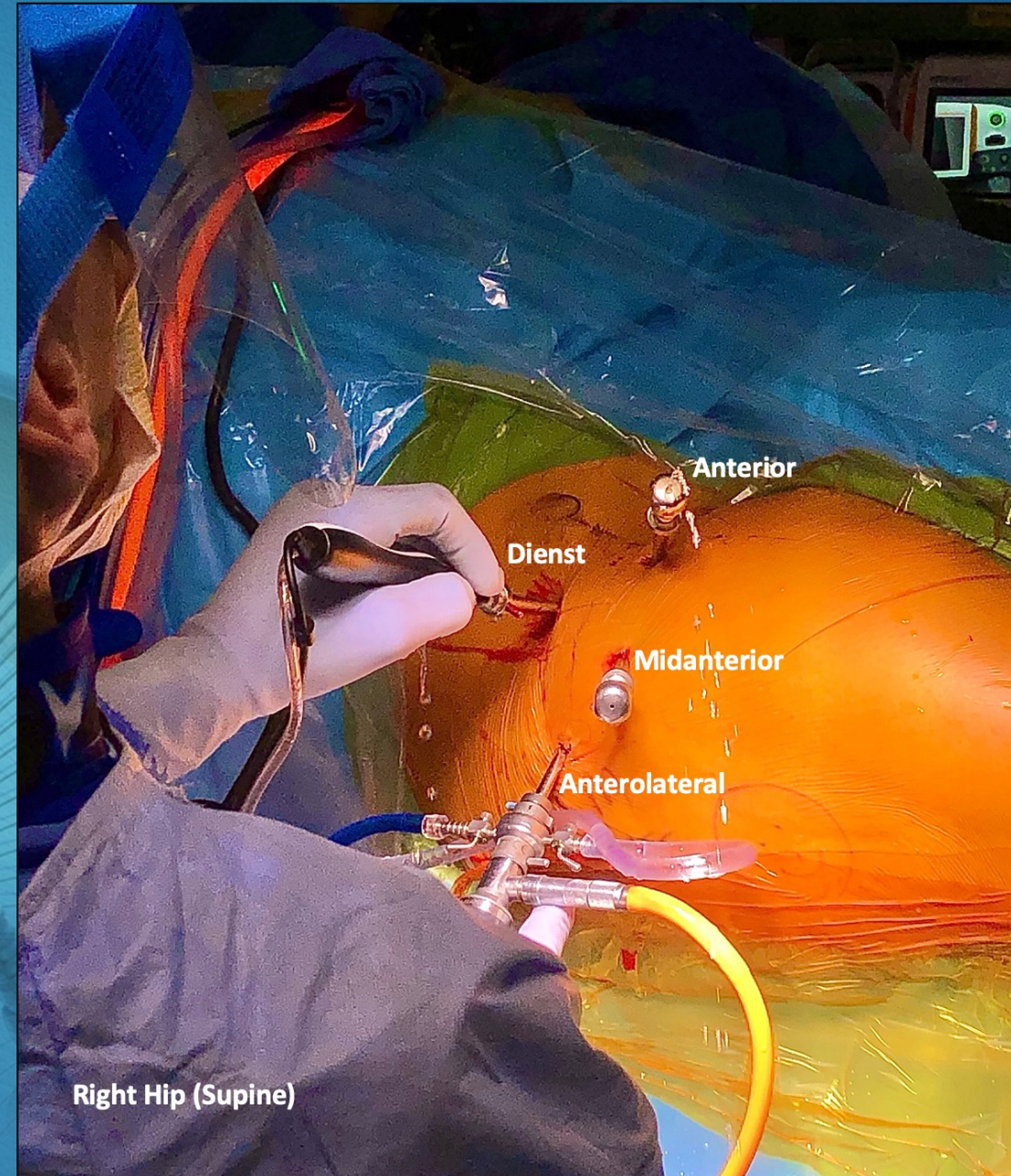


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Introduction

- **Puncture Capsulotomy**
 - **Multiple, small portals**
 - Extended capsulotomy not necessary
 - Iliofemoral ligament preserved
 - **Theoretical Advantages:**
 - Preservation of native hip biomechanics
 - Elimination of anterior dislocation risk
 - Minimal disruption of soft tissues
 - decreased risk of heterotopic ossification
 - No postoperative range-of-motion restrictions
- **Purpose:**
 - Evaluate mid-term functional outcomes associated puncture capsulotomy in the treatment of labral tears

Figure 1. Quadrilateral arrangement of arthroscopic portals



Methods

- Hip arthroscopy via puncture capsulotomy
 - Single surgeon (SDM)
 - December 2013 - May 2019
- Inclusion:
 - Age ≥ 18 years
 - Completed *minimum two years* of patient-reported outcome measure (PROM) surveys
- Baseline demographics
- Preoperative imaging (XR/MRI)
- Intraoperative evaluation
- Same strict postoperative rehabilitation protocol
- Outcomes:
 - PROMs
 - mHHS, HOS-ADL, HOS-Sport, iHOT-33 and VAS
 - Clinically Meaningful Outcomes
 - MCID, PASS, SCB

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Methods

• Surgical Technique

• Anterolateral Portal:

- 1cm anterior to the greater trochanter
 - approximately 15-20° cephalad, parallel to the floor

• Anterior Portal:

- Intersection of
 - vertical line drawn from anterior superior iliac spine
 - horizontal line drawn at level of anterolateral portal

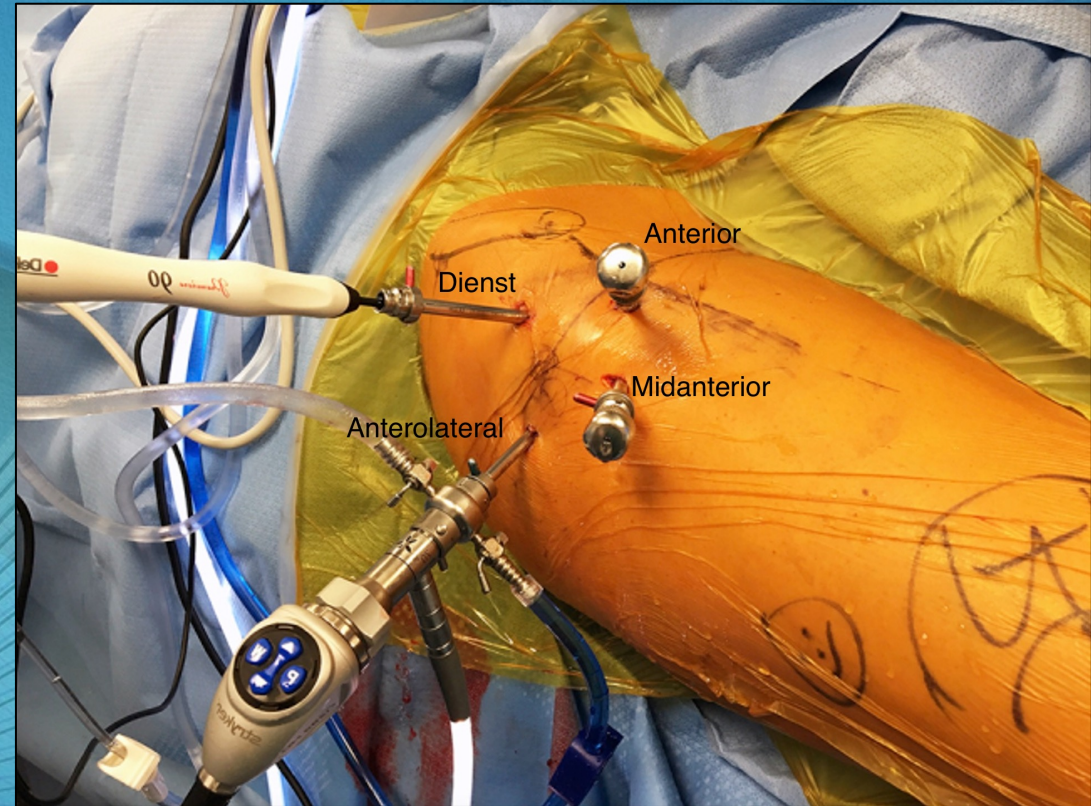
• Midanterior Portal:

- Equal distance
 - from anterior & anterolateral portals distally

• Dienst Portal:

- One-third the distance between
 - anterior superior iliac spine and anterolateral portal

Figure 2. Quadrilateral arrangement of arthroscopic portals



Results

- **Total hips: 163**
 - **84 (51.5%) female**
 - **79 (48.5%) male**
 - **Mean BMI**
 - **25.9 (95% CI: 25.2-26.5) kg/m²**
- **Tönnis Grade 1 or worse**
 - **69.3%**
- **Median Outerbridge Grade**
 - **3**

Baseline Demographics		
	N=163	
Males	79	48.5%
Females	84	51.5%
Age [years] (Mean (95% CI))	37.9 (36.1-39.6)	
BMI [kg/m²] (Mean (95% CI))	25.9 (25.2-26.5)	
Laterality		
Right	81	49.7%
Left	82	50.3%
Tönnis Grade (Median)	1	
Grade 0	50	30.7%
Grade 1	95	58.3%
Grade 2	18	11.0%
Grade 3	0	0.0%
Tönnis Angle (Mean (95% CI))	6.3 (5.4-7.3)	
Center Edge Angle (Mean (95% CI))	36.4 (35.4-37.5)	
Labral Repair	150	92.0%
Labral Debridement	13	8.0%
Outerbridge Grade (Median)	3	
Grade 0	2	1.2%
Grade I	11	6.8%
Grade II	47	28.8%
Grade III	79	48.5%
Grade IV	24	14.7%
Femoroacetabular Impingement Treatment		
None	17	10.4%
Acetabuloplasty	82	50.3%
Femorooplasty	11	6.7%
Femoroacetabuloplasty	53	32.5%

Table 1. Baseline Demographics

Results

- **Average final follow-up (FFU):**
 - 30.4 (95% CI: 28.5-32.3) months
- **Significant increases in functional outcomes across all PROMs**
 - Enrollment to FFU
- **Clinically meaningful outcomes**
 - iHOT-33; enrollment to 2 years
 - **MCID**
 - 132 (81.0%) hips
 - **PASS**
 - 101 (62.0%) hips
 - **SCB**
 - 96 (58.9%) hips

Table 2. Prospectively collected PROMs

*Statistically significant ($\alpha = 0.05$), reference: Enrollment

Abbreviations: modified Harris Hip Score (mHHS), Hip Outcome Score-Activities of Daily Living (HOS-ADL), Hip Outcome Score-Sports Specific Subscale (HOS-Sport), International Hip Outcome Tool (iHOT-33), Visual Analog Scale (VAS)

PROSPECTIVELY COLLECTED PROMS						
		n	Mean	95% CI		P Value
mHHS	Enrollment	162	60.1	57.9	62.4	-
	3-months	129	75.7	73.5	77.8	<0.001*
	6-months	134	80.6	78.6	82.6	<0.001*
	12-months	145	84.9	82.9	86.9	<0.001*
	FFU	160	84.9	82.5	87.2	<0.001*
HOS-ADL	Enrollment	162	70.0	67.0	73.0	-
	3-months	128	79.9	77.8	82.0	<0.001*
	6-months	134	86.0	84.0	87.9	<0.001*
	12-months	145	88.9	87.0	90.8	<0.001*
	FFU	160	89.3	87.3	91.3	<0.001*
HOS-Sport	Enrollment	162	41.8	37.9	45.6	-
	3-months	126	41.8	37.1	46.4	0.410
	6-months	133	63.2	58.8	67.5	<0.001*
	12-months	143	72.0	67.9	76.1	<0.001*
	FFU	160	75.7	71.7	79.7	<0.001*
iHOT-33	Enrollment	160	39.6	36.8	42.4	-
	3-months	130	60.5	57.7	63.3	<0.001*
	6-months	132	69.4	66.4	72.4	<0.001*
	12-months	144	74.4	71.1	77.7	<0.001*
	FFU	158	76.1	72.7	79.6	<0.001*
VAS	Enrollment	159	6.3	5.9	6.7	-
	3-months	129	2.8	2.5	3.1	<0.001*
	6-months	131	2.4	2.1	2.8	<0.001*
	12-months	143	2.4	2.0	2.8	<0.001*
	FFU	157	2.2	1.8	2.6	<0.001*

Results

• Complications

• None

- 144 (88.3%) patients

• Heterotopic ossification

- 11 (6.7%) patients

• No incidences

• Infection

• Avascular necrosis of the femoral head

• *Dislocation/instability*

• Femoral neck fracture

Table 3. Incidences of Complications Following Hip Arthroscopy via Puncture Capsulotomy

Complications	n	%
None	144	88.3%
Heterotopic Ossification	11	6.7%
Deep Venous Thrombosis	3	1.8%
Transient Neuropraxia (Peroneal)	2	1.2%
Trochanteric Bursitis	1	0.6%
Total Hip Arthroplasty	2	1.2%
Infection	0	0.0%
Avascular Necrosis of the Femoral Head	0	0.0%
Dislocation/Instability	0	0.0%
Femoral Neck Fracture	0	0.0%

Discussion & Conclusion

- Puncture capsulotomy for hip arthroscopy
 - Demonstrated significantly improved functional outcomes
 - minimum two-years follow-up
- VAS pain scores significantly improved
 - throughout the postoperative period
- Favorable outcomes
 - exceeded MCID, PASS and SCB thresholds
 - in majority of patients
- Addresses clinical demand for an alternative arthroscopic approach
 - Maintains capsuloligamentous integrity
 - Provides appropriate osseous visualization
 - Generates excellent functional outcomes

Limitations

- No comparison arm
 - comparative efficacy to other techniques was *not* directly assessed
- Puncture capsulotomy has *not* been biomechanically tested
 - needed to confirm its biomechanical advantage
- May be **more challenging** than other techniques
 - especially for addressing femoral lesions
 - learning curve
- Patients undergoing hip arthroscopy by the senior surgeon (SDM)
 - understood a novel technique & theoretical benefits
 - Susceptible to bias
- **Long-term evaluation** of outcomes warranted
 - to completely encompass benefits of puncture capsulotomy

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Thank You

