

# Mini invasive Hip Arthroplasty

## Review of the Literature



CABINET DES DOCTEURS PAILLARD ET DAGHER

Elias Dagher, Clinique des Lilas, Paris, France

# Mini Invasive Surgery

- Maximum preservation of hip's muscular environment

# Mini invasive

- Anterior
- Antero-lateral
- Two incisions

# Mini incision

< 10 cm

- Posterior
- Lateral

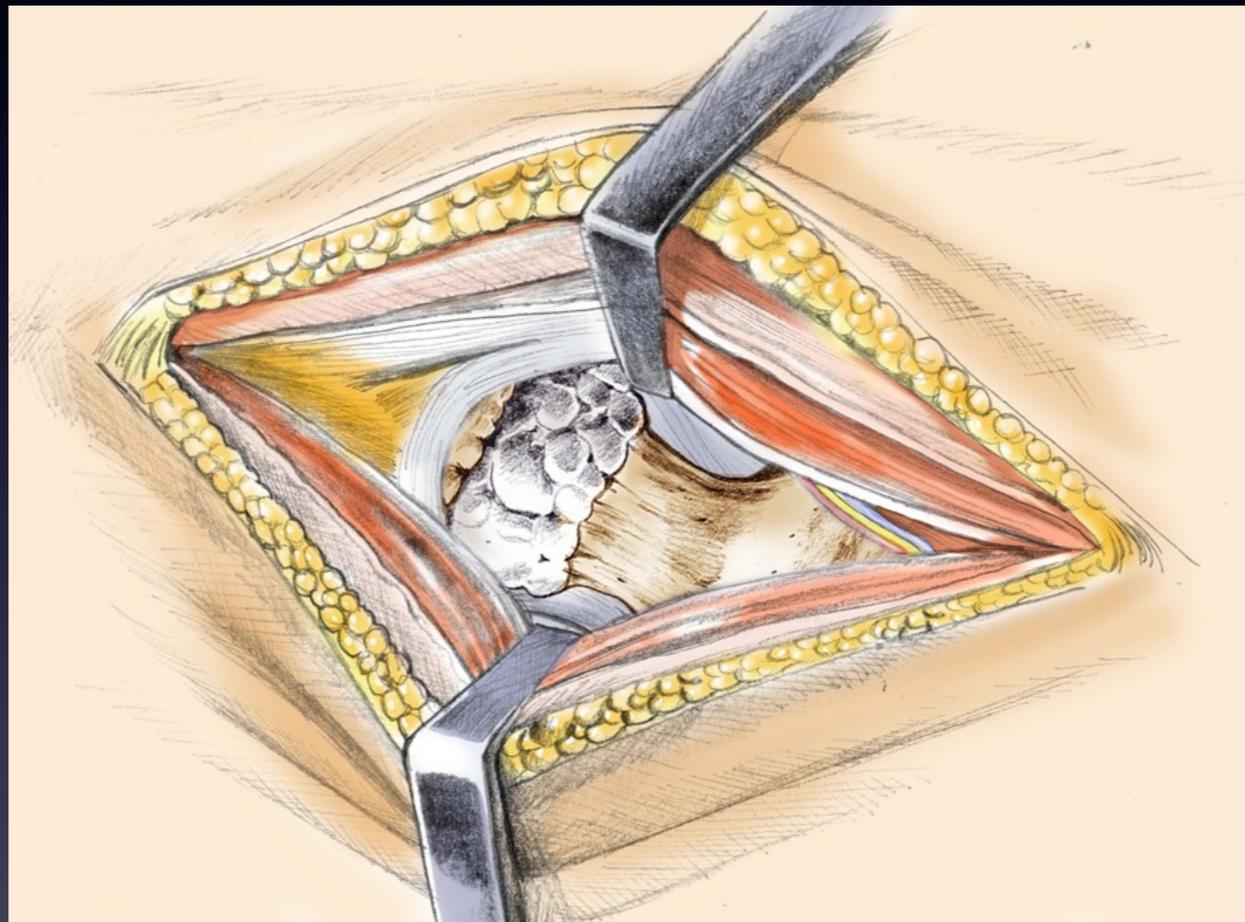
# Advantages

- Reduction of blood loss
- Reduction of post operative pain
- More rapid recovery
- Shorter duration of hospital stay
- Earlier return to normal daily living

# Complications

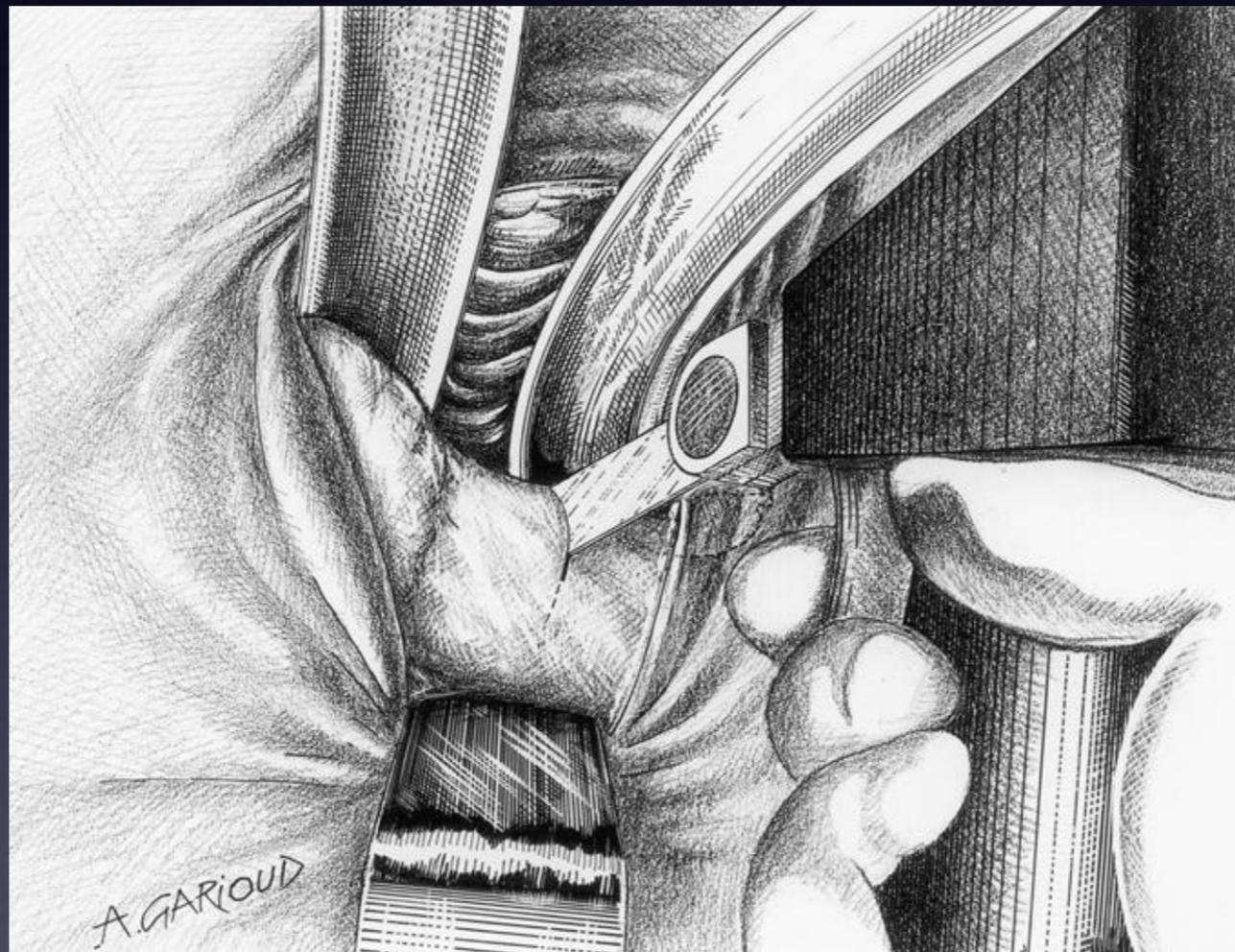
- Inadequate prosthetic implantation
- Fractures

# Anterior Approach



## Judet J, Judet R

The use of an artificial femoral head for arthroplasty of the hip joint  
J Bone Joint Surg 1950; 32B:166–17



Light TR, Keggi KJ  
Anterior approach to hip arthroplasty  
Clin orthop 1980;152:255–60

104 THA

2 dislocations

2 hypoaesthesias of the femoral-cutaneous nerve

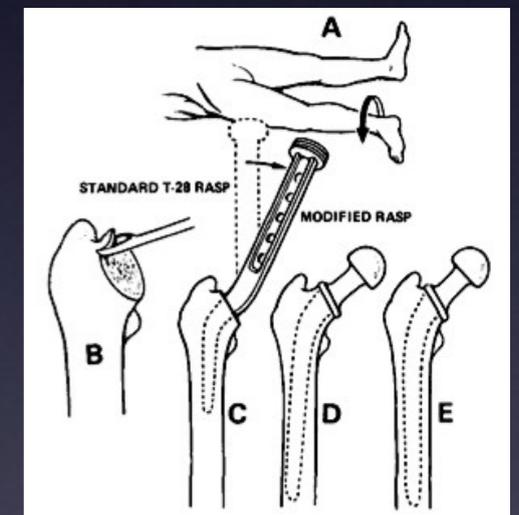
Reduction of blood loss, of postoperative morbidity, of hospital stay

More rapid recovery

The femoral exposure necessitated 3 anterior trochanterotomies

Excellent visualization of the acetabulum is afforded by this direct approach

Modified femoral rasps are employed with the leg in external rotation



The anterior approach provides a safe and effective approach to total hip arthroplasty  
with limited morbidity

Kennon RE, Keggi JM, Wetmore RS, et al.

Total hip arthroplasty through a minimally invasive anterior surgical approach

J Bone Joint Surg Am. 2003;85(Suppl 4):39-48

2132 consecutive THA

28 (1.3%) dislocations

31 (1.5%) hematomas

5 (0.23%) infections

87 (4.1%) fractures

9 nerve injuries



Patients were discharged on the third or fourth postoperative day

They concluded that their anterior approach (with or without accessory portals) is versatile, providing excellent long-term outcomes with minimal complications via a small incision and muscle sparing exposure

Siguier T, Siguier M, Brumpt B.

Mini-incision anterior approach does not increase dislocation rate: A study of 1037 total hip replacements.

Clin Orthop Relat Res. 2004;(426):164-73.

1037 THA

10 (0.96%) dislocations

8 (0.77%) underwent revision surgery as follows:

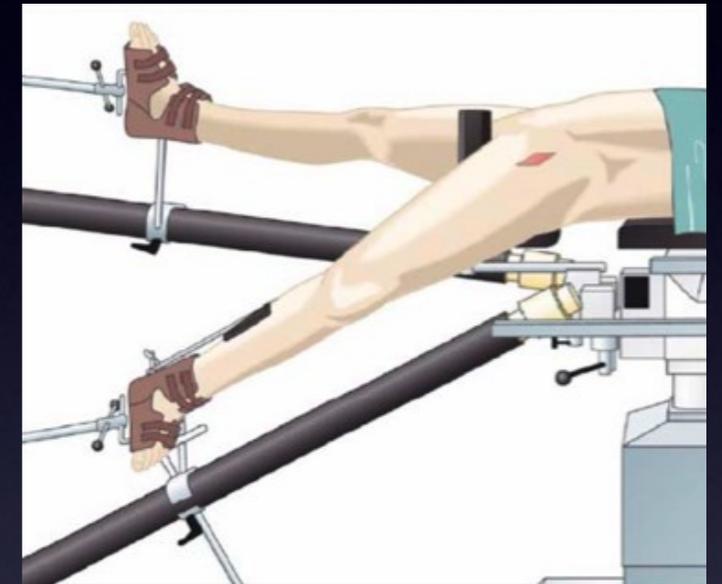
3 septic loosening, 3 aseptic loosening, 2 recurrent dislocations

No heterotopic ossification, clinical limp, or Trendelenburg gait

Difficult exposure in 15 cases of obese patients

In 8 muscular males the piriformis tendon was sectioned for enhanced visualization

The authors concluded this was a safe technique that afforded a low dislocation rate and reproducible implantation of THA components via an approach that avoids sectioning of any muscles or tendons



Matta JM, Shahrदार C, Ferguson T

Single-incision Anterior Approach for Total Hip Arthroplasty on Orthopaedic Table

Clin Orthop Relat Res. 2005;(441):115-124.

494 unselected, consecutive THA

Fluoroscopic-assisted anterior mini-incision approach

Length of surgery : 90 min

Hospital stay: 4 days

Walking without external support : 10 days

5 complications (1 infection, 3 dislocations, 1 temporary femoral nerve palsy)

Abduction angle : 41°

Anteversion angle : 23°

Average leg length discrepancy was 3 mm

Matta concluded that the mini-incision anterior approach with an orthopaedic table allows for no postoperative hip precautions with good outcomes, minimal complications, and maintenance of accurate leg lengths

Rachbauer F,  
Minimally invasive total hip arthroplasty via direct anterior approach.  
Orthopade 2005; 34(11): 1103-10

100 consecutive THA without exclusion criteria

Cup inclination 44.1°

Stem varus/valgus angles 0°

WOMAC score at six weeks was 90.4

Reduced Blood loss, postoperative pain, and length of hospital stay

Quicker Rehabilitation

3 complications (1 proximal femur fracture, 1 acetabular perforation, 1 infection)

**The investigators concluded that this minimally invasive anterior approach  
was safe and advantageous**

Nakata K, Nishikawa M, Yamamoto K, Hirota S, Yoshikawa H  
A Clinical Comparative Study of the Direct Anterior With Mini-Posterior  
Approach Two Consecutive Series  
J Arthroplasty June 2008 Epub ahead of print

195 THA Comparative Study

Direct anterior approach (DAA, 99 hips)

Mini-posterior approach (MPA, 96 hips)

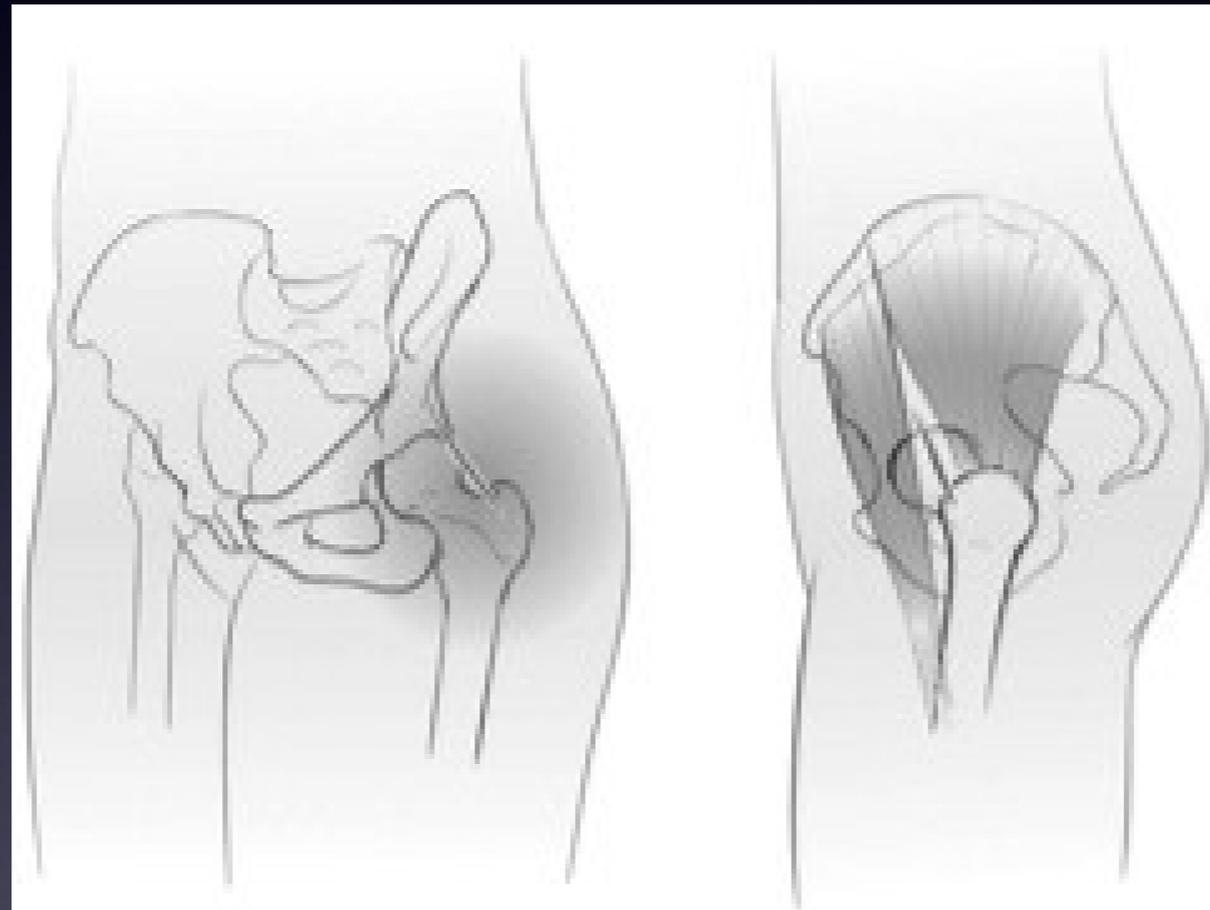
Cup implantation : 99% within the safe zone in the DAA group  
91% within the safe zone in the MPA group (P = .008)

50-m walking time of 52.3 seconds in the DDA group (P = .017)

Improvement in the use of assistive walking aids at 3 weeks postoperatively (P = .031)

The results of this study suggest more rapid recovery for hip function and gait ability after  
MIS-THA via a DAA when compared to an MPA

# Antero Lateral Approach



Bertin KC, Rottinger H

Anterolateral mini-incision hip replacement surgery: a modified Watson-Jones Approach  
Clin Orthop Relat Res (2004) 429:248–55

Bertin and Rottinger have performed over 300 THA using this approach

No published results

For obese and muscular patients, they recommended 1 to 2 cm extension of the incision

These authors are cautiously optimistic that this approach will provide universally successful long-term results

Further experience (as exposure of femur is challenging)

Improved instrumentation

Computer navigation (as consistent acetabular component positioning is difficult)

May enhance outcomes with this approach in the future.

J. M. Laffosse, P. Chiron, F. Molinier, H. Bensafi, J. Puget

Prospective and comparative study of the anterolateral mini-invasive approach versus minimally invasive posterior approach for primary total hip replacement. Early results

International Orthopaedics (SICOT) (2007) 31:597–603

The duration of surgical procedure was longer and the calculated blood loss more substantial in the ALMI group.

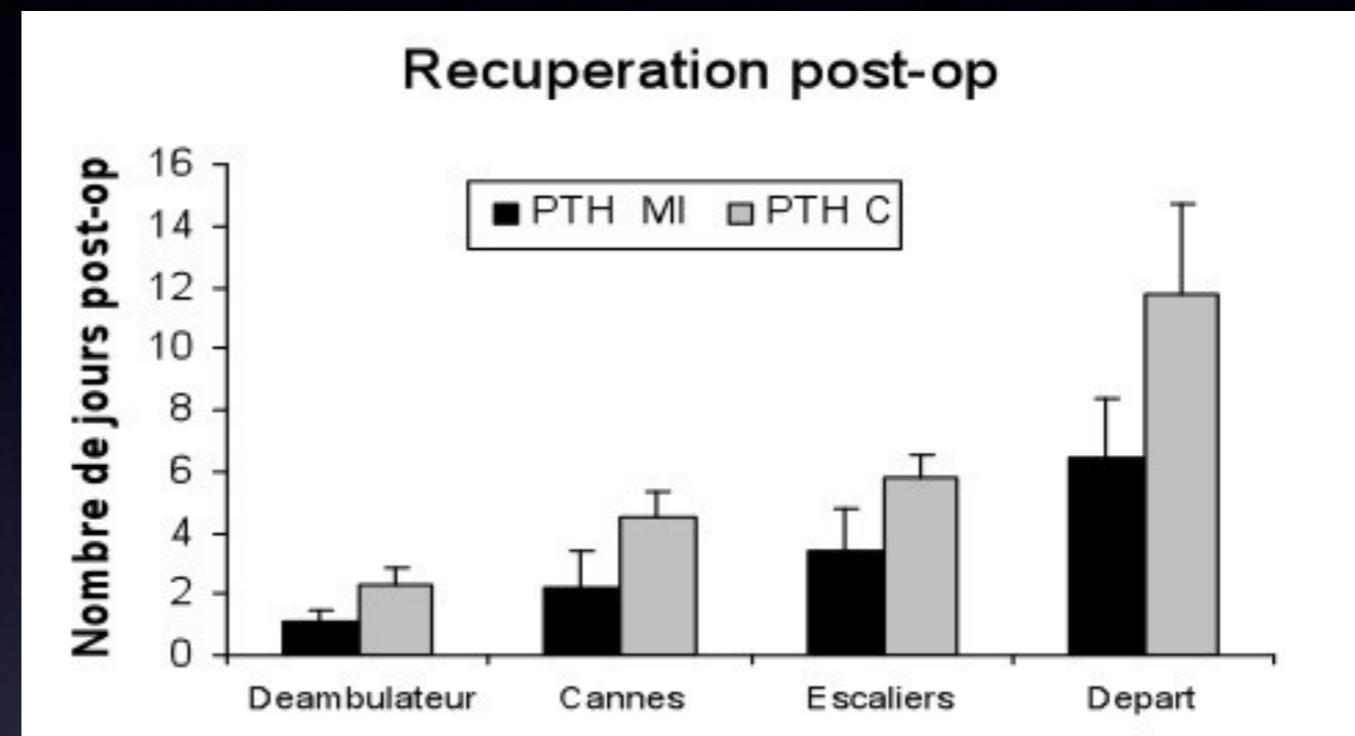
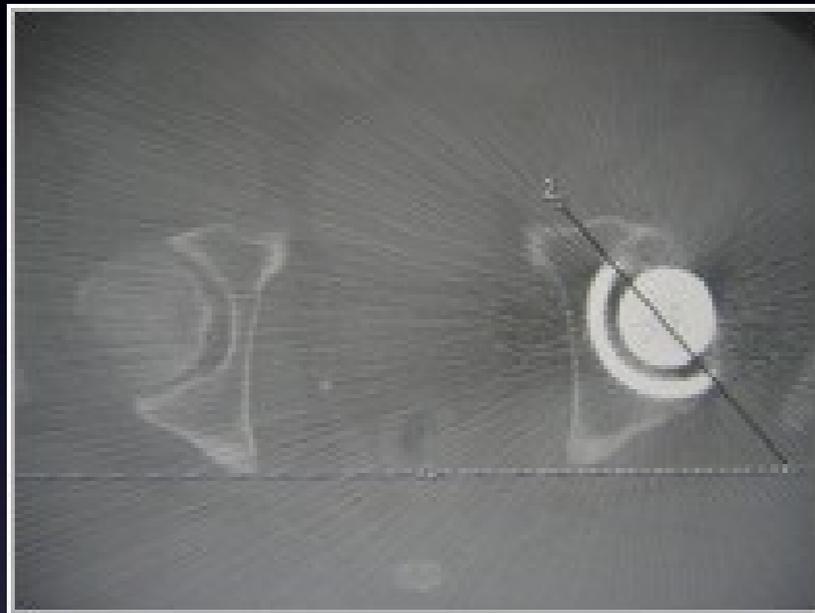
The perioperative complications were significantly more frequent in the ALMI group, with four greater trochanter fractures, three false routes, one calcar fracture, and two rocking metal backs

Other postoperative data (implant positioning, morphine consumption, length of hospital stay, type of discharge) are comparable, as were the early functional results.

Once the learning period is passed, and a more standardised procedure achieved, surgeons should hope to obtain better results in patients operated on using the anterolateral mini invasive approach, with a decrease in complications and in perioperative blood loss

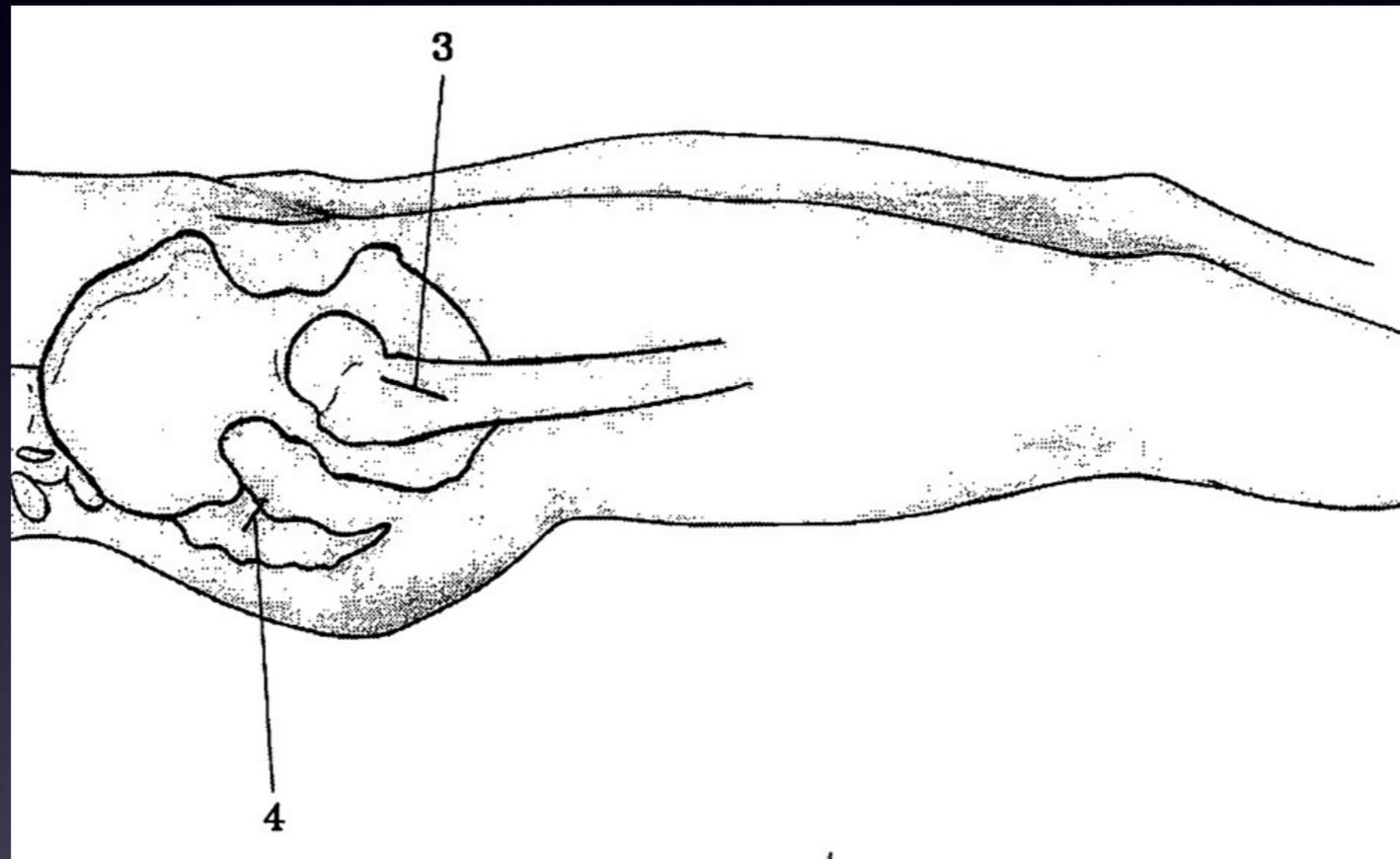
Dagher E, Kempf JF

Arthroplastie totale de la hanche par mini voie de Waston-Jones:  
bénéfices précoces et étude du positionnement des implants  
Revue de Chirurgie Orthopédique Volume 93 N° 6S Oct. 2007



	PTH-MI	PTH-C	p
Antéversion du cotyle	45,1° ± 10,5°	32,7° ± 6,9°	< 0,05
Inclinaison du cotyle	41,2° ± 8,8°	42,5° ± 9,4°	>0,05
Antéversion de la tige	24,1° ± 8,2°	17,3° ± 7,3°	< 0,05

# Two Incisions Approach



# Two Incisions Approach

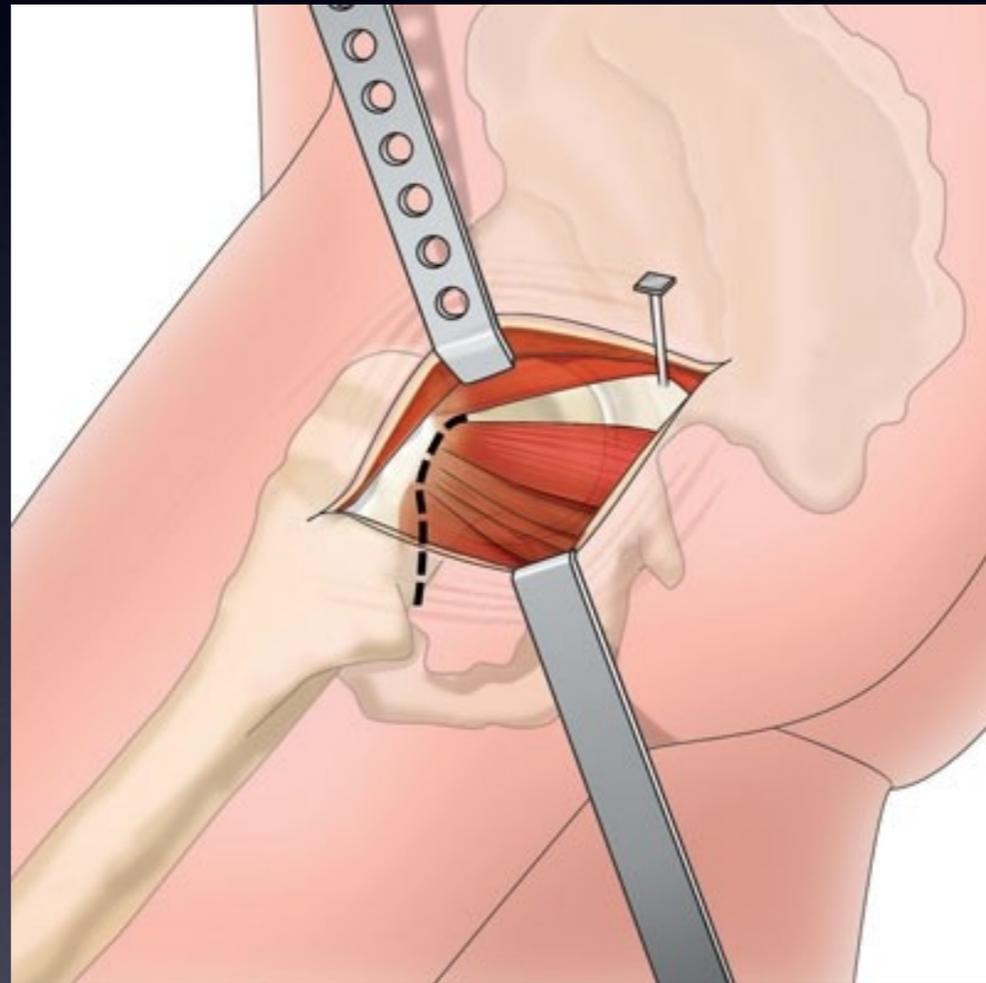
- Recent approach
- Lurning curve

# Two Incisions Approach

	Number of Cases	Average BMI	Incision Length	Dislocations	EBL	Surgical Time (minutes)	Length of Stay	HHS
<b>Two-incision</b>								
Berger	100	176 lb	n/a	0	291 cc	101	< 1 day	n/a
Duwelius	100	~162.5 lb	n/a	2 (2%)	n/a	90	< 1 day	90
Hartzband	100	~174 lb	n/a	0	n/a	62	< 1 day	n/a
Mears	75	~205 lb	n/a	0	n/a	85	< 1 day	n/a
Archibeck	851	26	9.5 cm	8 (0.9%)	496 cc	148	n/a	n/a
<b>Totals</b>	<b>1226</b>	<b>~178 lb</b>	<b>9.5 cm</b>	<b>10 (0.8%)</b>	<b>474 cc</b>	<b>129</b>	<b>&lt; 1 day</b>	<b>90</b>

Good results reported by promoters  
High complication rate

# Posterior Approach



# Posterior Approach

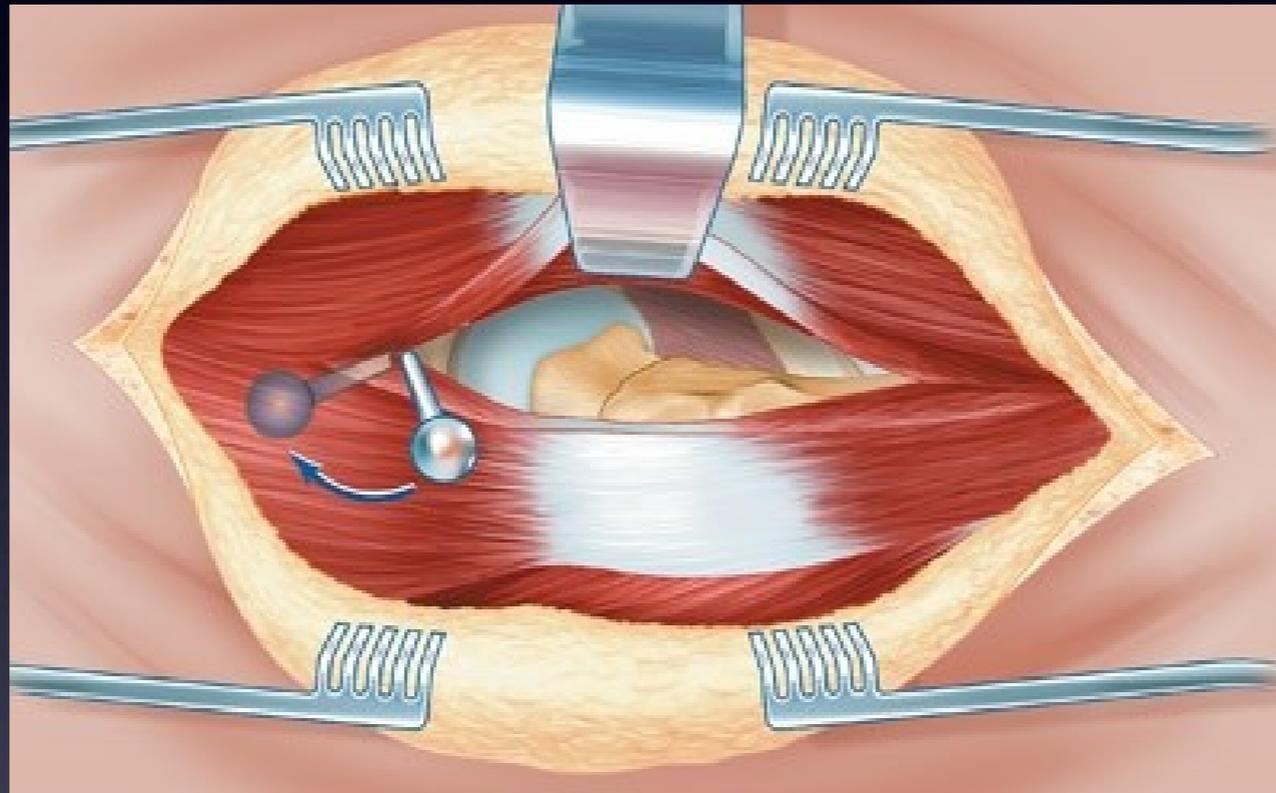
- Most frequently used
- High rate of postoperative dislocation (1% to 9%)
- Greater number of publications

# MIS Posterior Approach

	Number of Cases	Average BMI	Incision Length	Dislocations	EBL	Surgical Time (minutes)	Length of Stay	HHS
<b>Posterior</b>								
Hartzband	100	28.3	7.26 cm	0	n/a	37.4	2.89 days	n/a
Wright	42	24.4	8.8 cm	0	151.8 cc	71.4	6.12 days	86.9
Sculco‡	28	25.2	8 cm	0	127 cc*	71	5.8 days	n/a
Sculco	254	27.5	8.9 cm	0	n/a	n/a	n/a	n/a
Dorr	105	26.2	8.2 cm	0	n/a	62	3.6 days	n/a
Nakamura	50	23.2	10.3 cm	0	339 cc*	99*	n/a	n/a
Wenz	124	29*	7.8 cm	1 (0.8%)	598 cc*	124*	3.8 days	n/a
Goldstein	85	27*	13 cm	1 (1.1%)	273 cc*	57	n/a	85
Woolson	50	25.1*	<10 cm	0	603 cc	97	4.3 days	n/a
Lester	102	n/a	10-15 cm	1 (1.0%)	347 cc	37	3.5 days	95
Waldman	32	28.2	~8 cm	0	n/a	n/a	2.8 days	94
Ogonda‡	109	28.2	9.5 cm	1 (0.9%)	314 cc*	60.3	3.65 days	84.2
Chung	60	n/a	9.2 cm	0	136 cc	49	4.41 days	95.5
<b>Totals</b>	<b>1141</b>	<b>27</b>	<b>~9.3 cm</b>	<b>4 (0.3%)</b>	<b>357 cc</b>	<b>72.9</b>	<b>3.9 days</b>	<b>89.5</b>

Conflicting publications

# Lateral Approach



# MIS Lateral Approach

Several studies show an increase limp (10% to 26% of cases) and significant denervation of the abductors (23% decrease in abductor strength)

However, very low rates of hip dislocation (typically less than 1%) have been documented when using this approach

# MIS Lateral Approach

	Number of Cases	Average BMI	Incision Length	Dislocations	EBL	Surgical Time (minutes)	Length of Stay	HHS
<b>Direct Lateral</b>								
Higuchi	115	23*	< 10 cm	3 (2.4%)	184 cc*	69.7*	n/a	n/a
Howell	50	26.2*	<10 cm	0	387 cc*	97†	4.4 days*	n/a
Ilizaliturri	40	28.19	8.2 cm	0	584 cc	n/a	2.31 days	n/a
Berger	99	n/a	7.2 cm	0	154 cc*	72	1.9 days*	n/a
de Beer	30	32.4	7.7 cm	0	180 cc*	46.6	5.1 days	77.1
<b>Totals</b>	<b>334</b>	<b>25.7</b>	<b>~ 7.75cm</b>	<b>3 (0.9%)</b>	<b>253 cc</b>	<b>72.8</b>	<b>3.0 days</b>	<b>77.1</b>

No real difference with standard lateral

## Which is the best minimally invasive approach?

The lack of negative publications regarding the anterior access and the two important series having used this access suggest the superiority of this technique

However, the insufficient number of publications and the lack of postoperative clinical evaluation diminish its scientific credibility

No real series of antero-lateral access exist as yet

Minimally invasive surgery does not provide any additional benefit to lateral access in comparison to the classical procedure

Uncertainty is attached to the posterior access since there are conflicting publications regarding its minimally invasive application.

# Should we keep developing minimally invasive surgery? Is it reproducible?

Of course, publications that promote this surgery are optimistic and consider minimally invasive surgery to be the technique of the future

It is interesting also to notice that a lot of articles, although recommending cautiousness, and even negative regarding this technique, agree with the fact that it may present some interest and that its development is ineluctable

All authors agree with the fact that until this surgery clearly demonstrates its harmlessness and advantages, it should be performed only by a limited number of adequately trained surgical teams

In fact, it is very rare to find those who are strictly against it

## Does it induce any danger for the patients?

catastrophic results:

important acetabular defect

cross-sectional fracture of the acetabulum

comminuted fracture of the greater trochanter

implant malpositions



# Perfect Approach

Such a technique should be:

Easy to understand, teach, and perform,  
while allowing precise, reproducible implantation of various prosthetic options

Long-term results ultimately need to be equal or better than the current gold standard

In order to be universally accepted, the approach must require a minimal number of assistants and afford only a nominal risk to the surrounding neurovascular structures

The overall goals should be to decrease pain, length of hospital stay, and time to ambulatory independence, while yielding negligible risk for concomitant morbidities

- Training programs
- Adapted instrumentation
- Navigation
- Sharing experience

Thank You