

## Lessons learned in MIS

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- Definitions
- Literature review
  - Clinical results
  - Recovery
  - Patient selection
  - Operative time
  - Blood loss
  - Serum tissue markers
  - Muscle damage
  - Gait kinematics
  - Discharge
  - Cosmesis
  - Component position
  - Complications


- Minimally invasive hip arthroplasty
  - Size
  - Minimize soft tissue trauma
  - Pain management
  - Physical therapy protocols
  - Attitude – surgeon, staff and patient



## Definitions


- Small incision – abbreviated classic incision
- Less invasive – modifications of the standard approaches with smaller incision and less soft tissue dissection
- Minimally invasive – novel intermuscular approach

Smaller incision  
 Disadvantages  
 Iatrogenic injury  
 Component malpositioning



New approaches  
 Learning curve  
 Different patient positioning  
 Different orientation

- Marketing and advertising
  - New technique, implants, instruments
  - Cost effective
  - Pressure from patients
  - Commercial pressure



- Difficult conclusions peer review
- Most series have patient selection and includes the surgeons learning curve

Review literature


- Different comparisons

Only 58% compared MIS and Std  
 (Mahmood, Br Med Bull 2007)

- Std HA / MIS HA / Different types of MIS HA


Inclusion

- Rapid rehabilitation protocols
- Patient education
- Advanced anaesthetic techniques
- Patient selection (Deformity, ↑ BMI, ↑ muscle mass)



### Questions

- Clinical evidence to support safety and efficacy?
- Does MIS HA provides superior outcomes compared to Std HA?



### Clinical results

- No difference SF-12 at 2 and 12 M (RCT; 2 Inc, Pos MIS – Pagnano, JBJS 2008)
- No difference SF-36, WOMAC, HHS (RCT; 2 Inc, Pos MIS, AL MIS – Meneghini, Clin Orthop 2009)
- ↑ HHS at 6 W and 1 Y for MIS
- ↑ SF 36 for MIS Pos (RCT; Pos MIS, Pos STD, AL MIS, AL STD – Goosen, Clin Orthop 2010)
- Current scoring systems low sensitivity

### Recovery

- Slower recovery 2 Inc than Pos MIS (RCT; 2 Inc, Pos MIS – Pagnano, JBJS 2008)
- Less use of assistive devices in Pos MIS (RCT; Pos MIS, Pos Std – Dorr JBJS A, 2007)
- No difference on early walking ability (RCT; Pos MIS, Pos Std – Ogonda, JBJS A 2005)
- No difference for incision; Faster with accelerated rehabilitation (RCT; Hardinge MIS, Hardinge Std – Pour, JBJS A 2007)

### Patient selection

- No effect of BMI or thigh circumference (RCT; Pos MIS, Pos STD, AL MIS, AL STD – Goosen, Clin Orthop 2010)



### Operative time

- Increase in operative time
  - 10 min, leaning curve effect (RCT; Pos MIS, Pos STD, AL MIS, AL STD – Goosen, Clin Orthop 2010)
  - 24 min in 2 Ins (RCT; 2 Inc, Pos MIS – Pagnano, JBJS 2008)
- Decreased operative time Pos MIS (RCT; Pos MIS, Pos Std – Kim, J Arthroplasty 2006)
- No difference (A MIS, AL MIS – Berend, JBJS 2009)
- Average surgical time 164 min A MIS (Woolson, J Arthroplasty 2009)

### Blood loss

- Average estimated blood loss 858 ml A MIS (Woolson, J Arthroplasty 2009)
- No difference in pos-op Hgb and blood loss (RCT; Pos MIS, Pos STD, AL MIS, AL STD - Goosen, Clin Orthop 2010)
- No difference in pos-op Htc and transfusion (RCT; Pos MIS, Pos Std - Ogonda, JBJS A 2005)  
(RCT; Pos MIS, Pos Std - Dorr JBJS A, 2007)

### Serum tissue markers

- No difference - CK, CPK, myoglobin (WJ MIS, Pos MIS, 2 Inc - Cohen, Clin Orth 2009)
- No difference - CK, myoglobin (RCT; Pos MIS, Pos STD, AL MIS, AL STD - Goosen, Clin Orthop 2010)

### Muscle damage

- MRI - lesion of gluteus minimus; No correlation with approach, BMI and score (AL MIS, Lat Std - Müller, Arch Orthop Trauma Surg 2010)
- Damage to gluteus medius and minimus greater in the 2 Ins (2 Ins, Pos MIS - Mardones, Clin Orthop 2005)

### Gait kinematics

- No difference, EMG - prolonged gluteal muscle signs in Hardinge STD (RCT; AL MIS, Hardinge STD - Pospischill, JBJS A 2010)
- No difference, pattern of abductor injury in AL MIS (RCT; 2 Inc, Pos MIS, AL MIS - Meneghini, J Arthroplasty 2008)
- No difference (RCT; Pos MIS, Pos Std - Dorr JBJS A, 2007)  
(RCT; Pos MIS, Pos STD - Bennett, Gait Posture, 2006)

### Discharge

- Earlier discharge to home Pos MIS  
(RCT; Pos MIS, Pos Std – Dorr JBJS A, 2007)
- No difference  
(RCT; Pos MIS, Pos Std – Ogonda, JBJS A 2005)  
(RCT; 2 Inc, Pos MIS – Pagnano, JBJS 2008)  
(RCT; 2 Inc, Pos MIS, AL MIS – Meneghini, Clin Orthop 2009)

### Cosmesis

- Psychological impact of improved cosmesis, motivation for recovery  
(Howell, Orthop Clin North Am 2004)
- Worst cosmetic results with mini incision  
(Woolson, Hip Society A Meeting 2004)
- Cosmesis of mini-incision scars may be inferior (Mow, Clin Orthop 2005)



### Component position

- No difference  
(RCT; Pos MIS, Pos STD, AL MIS, AL STD - Goosen, Clin Orthop 2010)  
(RCT; Pos MIS, Pos Std – Ogonda, JBJS A 2005)  
(RCT; Pos MIS, Pos Std – Dorr JBJS A, 2007)



### Complications

- No difference  
(RCT; 2 Inc, Pos MIS – Pagnano, JBJS 2008)  
(RCT; Pos MIS, Pos Std – Ogonda, JBJS A 2005)
- ↑ complications 2 Inc  
(RCT; 2 Inc, Pos MIS, AL MIS – Meneghini, Clin Orthop 2009)
- ↑ complications in AL MIS – not statistical  
(RCT; Pos MIS, Pos STD, AL MIS, AL STD - Goosen, Clin Orthop 2010)
- Major complication rate 9%  
(A MIS – Woolson, J Arthroplasty 2009)
- Reoperation in 10% due to femoral fracture  
(2 Ins – Bal, JBJS A 2005)

## Survivorship / revision

- MIS HA may be risk factor for early revision; Failures due to surgical errors (Graw, Clin Orthop 2010)



	MIS POS	Std POS	P
HHS Pré Op	46,4 ± 15,2	45,3 ± 13,5	0,3438
HHS Pós Op	94,9 ± 5,6	94,3 ± 5,2	0,2692
↓ Média Hgb	3,6 ± 1,2 g/dl	3,2 ± 1,6 g/dl	0,2959
Transfusão	0 U – 75,4%	0 U – 50%	0,0650
Inclinação acetabular	45,4° ± 7°	42,2° ± 5,7°	0,0676
Diferença distancia vertical (mm)	3,8 ± 4,2	5,2 ± 3,3	0,3245
Diferença distancia horizontal (mm)	- 3,8 ± 3,8	- 0,4 ± 4,1	0,0193
Diferença offset femoral (mm)	0,4 ± 6,9	0,9 ± 7,7	0,8532
Dismetria (mm)	1,1 ± 4,1	0,3 ± 3,5	0,5141

## Conclusions 1

- The MIS approaches are not the same
  - 2 Ins – Learning curve, increased complications rate
  - Anterior – Intermuscular, learning curve, not so familiar, special table, less friendly for the femur
  - AL – Abductor muscles, less friendly for the femur
  - Lateral – Abductor muscles reattachment
  - Posterior – Versatile, rotators, risk of dislocation

## Conclusions 2

- Component positioning should never be compromised secondary to limited anatomical vision. Navigation?
- Changes in anesthesia and rehabilitation protocols, have led to shorter hospital stays and faster recovery.
- MIS is safe in experienced hands. How reproducible are the results ?
- MIS as potential but still unproven benefits.