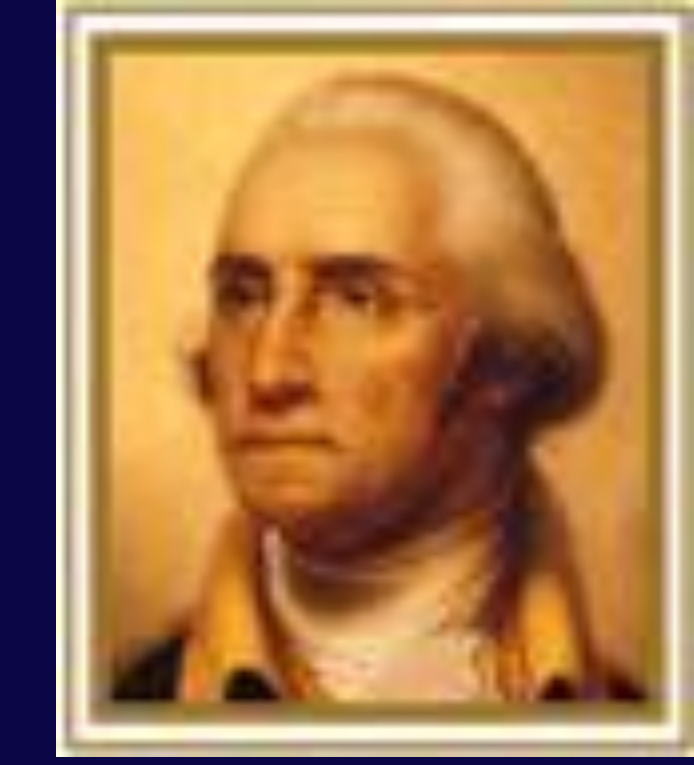




# A Prospective Comparison of Inflammation and Muscle Damage Markers in MIS Direct Anterior Versus MIS Posterior Total Hip Arthroplasty



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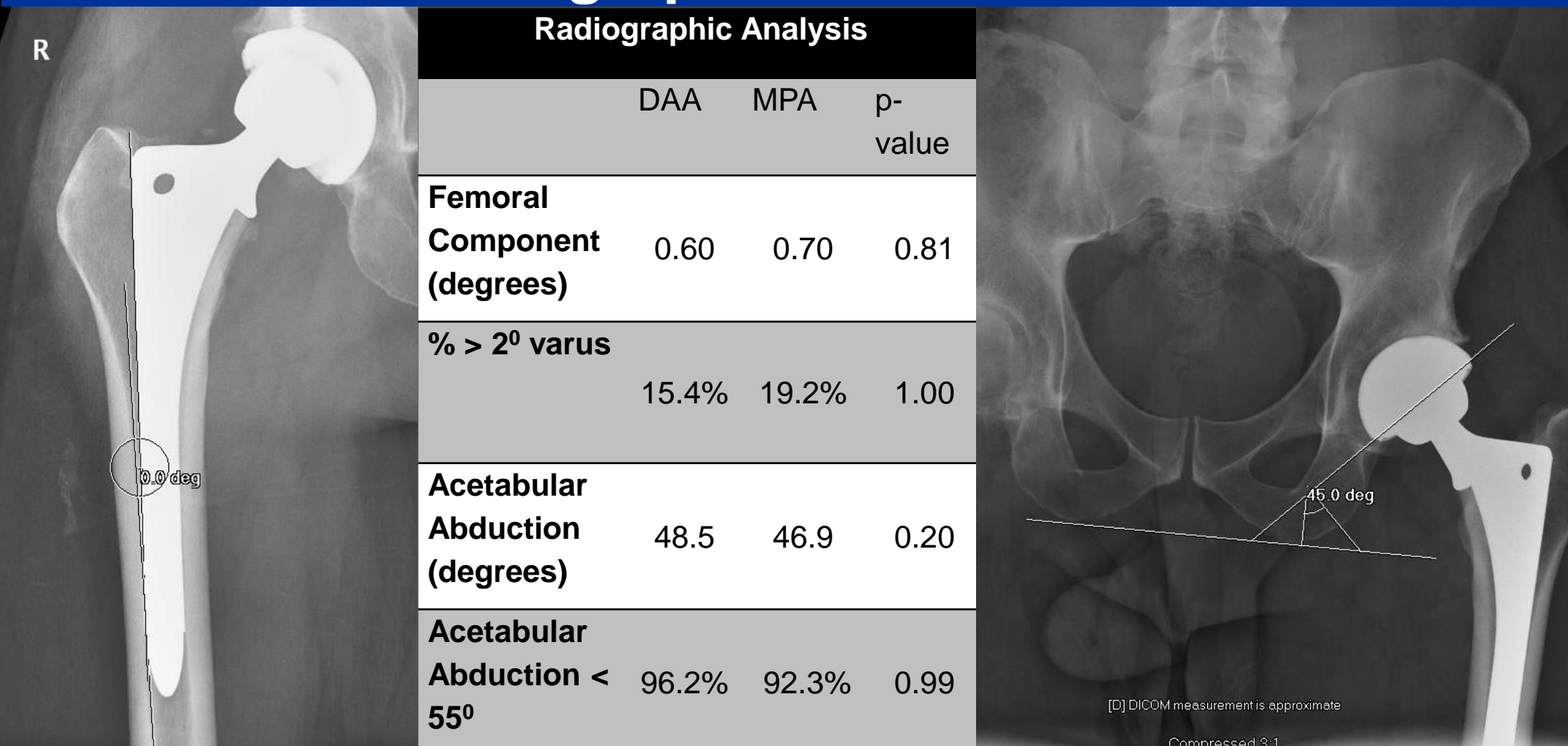
## Purpose

A number of surgical approaches are utilized in total hip arthroplasty (THA). The anterior approach has recently been hypothesized to result in less muscle damage. While clinical outcome studies are essential, they can be subject to patient and surgeon bias. Measuring biochemical markers of muscle damage and inflammation has been used to provide a more objective evidence of the surgical insult. We prospectively analyzed these differences in patients receiving anterior and posterior approach minimally-invasive THA to determine if there were any differences in muscle damage and inflammation.

## Methods

Fifty-seven consecutive patients were prospectively enrolled. Pre-operative data was collected including age, gender, BMI, WOMAC and Harris Hip scores. At the time of surgery, the ASA classification, thigh circumferences, estimated blood loss, and incision length were also recorded. Creatine kinase (CK), C-reactive protein (CRP), Interleukin-6 (IL-6), Interleukin-1beta (IL-1β), and Tumor necrosis factor-alpha (TNF-α) were collected pre-operatively, in the post anesthesia care unit, and on post-operative days 1 and 2. Transfusion requirements, decrease in hematocrit, and thigh swelling were also recorded. Cup abduction angle and stem alignment were measured on post-operative radiographs. Comparisons between the two groups were made using the Student's t-test and Fisher's Exact test.

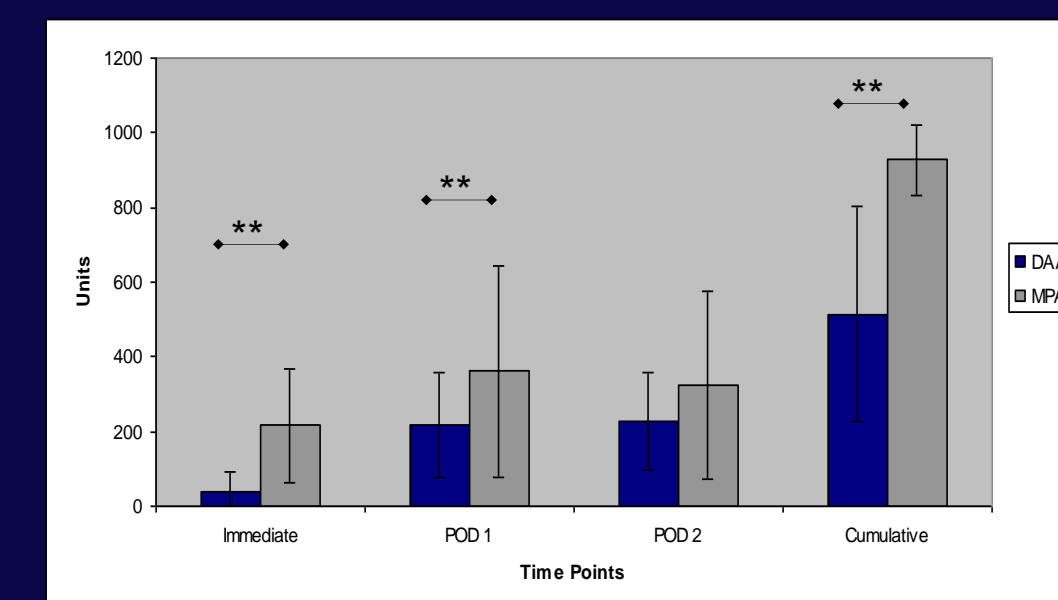
## Radiographic Measurements



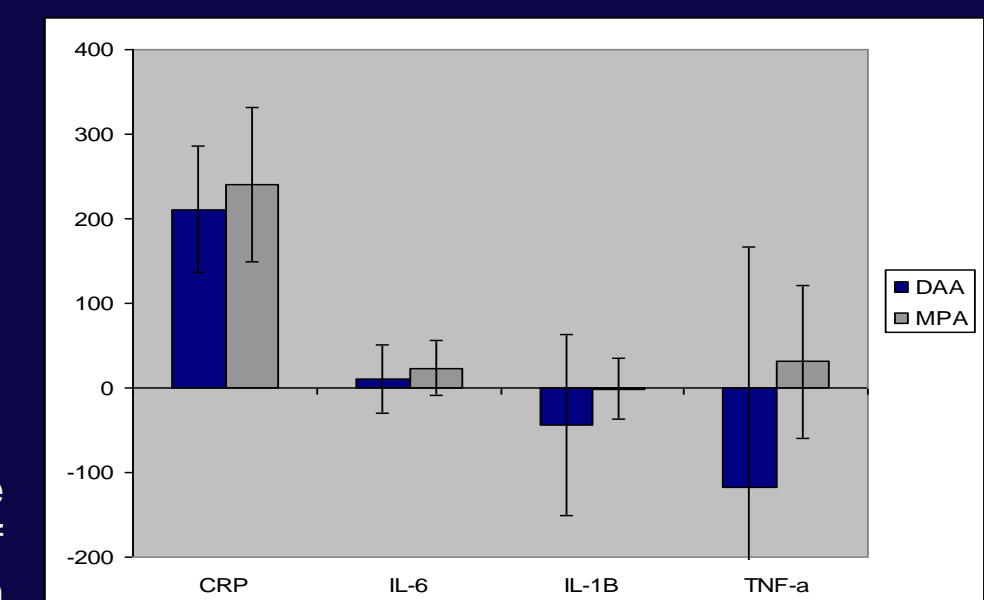
## Results

The two groups had similar demographics, admission lengths, transfusion requirements, and discharge dispositions. Markers of inflammation, CRP, IL-6, IL-1β, and TNF-α and were slightly decreased in direct anterior group. The rise in CK was 5.5 higher in the PACU and nearly twice as high cumulatively in the mini-posterior approach group (p<0.05). Component placement was similarly in both groups.

	Muscle Damage and Inflammatory Markers																		
	ΔCK				ΔCRP			ΔIL-6			ΔIL-1β			ΔTNF-α					
	Imm	Pod 1	Pod 2	Cum	Pod 1	Pod 2	Cum	Imm	Pod 1	Pod 2	Cum	Imm	Pod 1	Pod 2	Cum	Imm	Pod 1	Pod 2	Cum
<b>DAA</b>	39	217	227	514	55	149	211	-1.9	7.5	6.8	10.9	-0.9	-40.7	-2.9	-43.5	-19.7	-20.1	-33.3	-117.5
<b>MPA</b>	216	361	325	927	61	172	241	3.5	8.7	10.5	23.6	-3.0	-3.4	-6.1	-0.9	8.7	9.5	4.7	31.1
<b>p-value</b>	<b>0.00</b>	<b>0.02</b>	0.12	<b>0.00</b>	0.56	0.24	0.24	0.12	0.82	0.36	0.18	0.65	<b>0.01</b>	0.75	0.06	0.31	0.24	0.27	0.05



Left: CK values at various time points (\*\* = p<0.05)



Right: Cumulative values of markers of inflammation

## Patient Cohorts

	Pre-Operative Characteristics			Peri-Operative Factors			
	DAA (29 pts)	MPA (28 pts)	p-value	DAA	MPA	p-value	
<b>Age (yrs)</b>	68.8 +/- 9.1	65.1 +/- 11.3	0.20	<b>Incision Length (cm)</b>	12.1 +/- 15.4 +/-	<b>0.00</b>	
<b>Gender (% male)</b>	34.6% (9/26)	50.0% (13/26)	0.40	<b>Operative Time (min)</b>	78 +/- 118 +/-	<b>0.00</b>	
<b>BMI</b>	25.5 +/- 5.0	27.8 +/- 5.0	0.34	<b>Estimated Blood Loss (ml)</b>	360 +/- 191 312 +/- 138	0.30	
<b>ASA Grade</b>	2.0 +/- 0.6	1.9 +/- 0.5	0.80	<b>Transfusion (units)</b>	0.96 +/- 0.8 0.59 +/- 0.9	0.11	
<b>Harris Hip</b>	42.4 +/- 6.0	43.0 +/- 11.0	0.84	<b>Hematocrit Drop (%)</b>	9.7 +/- 4.6 8.5 +/- 2.8	0.33	
<b>WOMAC</b>	<b>Pain</b>	12.4 +/- 2.0	11.2 +/- 4.3	0.32	<b>Length of Hospitalization (days)</b>	3.9 +/- 1.1 3.3 +/- 1.4	0.10
	<b>Stiffness</b>	5.5 +/- 1.1	4.5 +/- 1.9	0.07	<b>Disposition (% to home)</b>	65.4% 80.8%	0.35
	<b>Physical function</b>	42.3 +/- 5.8	39.8 +/- 13.5	0.51	<b>Post-Op Thigh Circ. (cm)</b>	Troch. 64.1 +/- 6.2 66.2 +/- 9.8	0.48
<b>Pre-Op Thigh Circ. (cm)</b>	<b>Total</b>	60.1 +/- 7.4	55.4 +/- 18.2	0.35	<b>Mid-thigh</b>	53.0 +/- 4.7 54.1 +/- 8.6	0.66
	<b>Troch.</b>	56.1 +/- 5.6	60.0 +/- 10.1	0.17	<b>Δ Thigh Circ. (cm)</b>	Troch. 7.4 +/- 4.4 6.0 +/- 2.1	0.18
	<b>Mid-thigh</b>	49.0 +/- 6.1	49.5 +/- 8.2	0.84	<b>Mid-thigh</b>	3.6 +/- 3.7 4.2 +/- 2.1	0.51

## Disclosure

We have not received anything of value from or own stock (or stock options) in a commercial company or institution related directly or indirectly to the subject of this presentation.

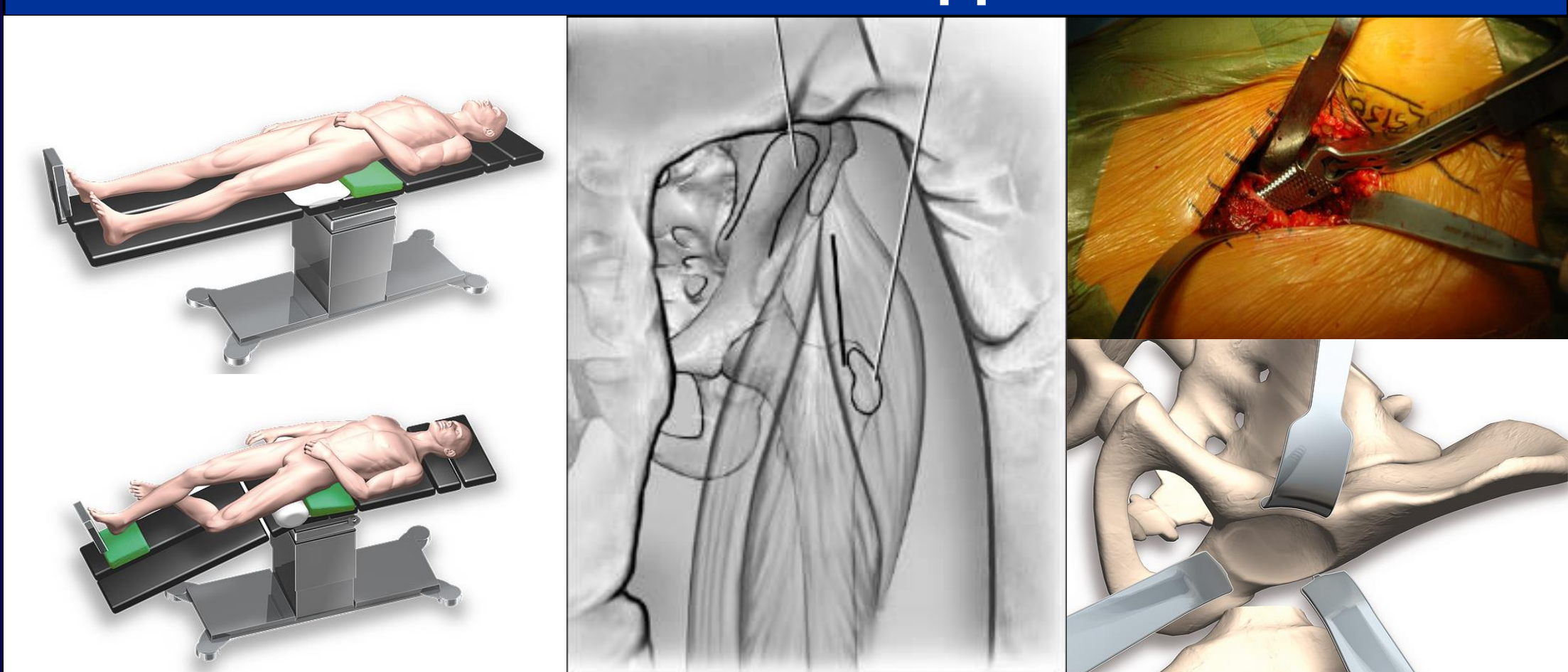
## Discussion

Anterior THA using a muscle-sparing approach caused significantly less muscle damage compared to traditional posterior surgery as indicated by CK levels. The overall physiologic burden as measured by CRP, IL-6, IL-1β, and TNF-α, however, appears to be similar. Objective measurement of muscle damage and inflammation provides an unbiased way of determining the immediate effects of surgical intervention in THA patients.

## CONCLUSIONS

- Direct anterior total hip arthroplasty causes significantly less muscle damage than MIS posterior THA.
- However, there were no differences in markers of inflammation or overall invasiveness
- Objective way to define “invasiveness” of procedures is needed

## Direct Anterior Approach:



Top left: the patient is placed on a flat OR table and the lower extremity is draped free  
 Bottom left: the bottom of the table is lowered 30° and the hip is extended, externally rotated and brought under the contralateral leg  
 Middle: Proper incision is vital and courses along the TFL  
 Top right: the femur is delivered into the wound and reamed and / or broached  
 Bottom right: 30° external rotation and hip distraction is important for acetabular exposure