

# STIFNESS AFTER FRACTURE: PREVENTION

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# NO SPECIAL SECRETS

- ✓ CORRECT PRE-OP APPROACH
- ✓ CORRECT DIAGNOSIS
- ✓ CORRECT TIMING
- ✓ CORRECT SURGICAL APPROACH
- ✓ CORRECT REDUCTION AND HARDWARE
- ✓ CORRECT REHABILITATION

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# PRE-OP APPROACH

- ✓ BED SKIN AND SOFT TISSUE CONDITION
- ✓ SWELLING




**POSTPONE THE TREATMENT!!**

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# PRE-OP APPROACH

- ✓ NEUROLOGICAL AND VASCULAR DEFICIT

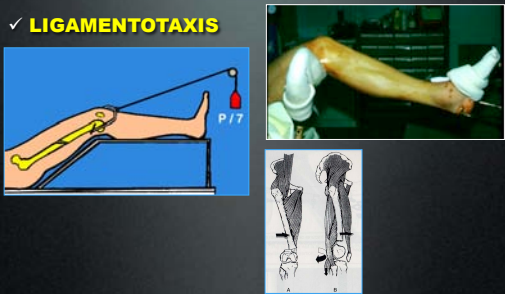
popliteal artery injury !!!



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# PRE-OP APPROACH

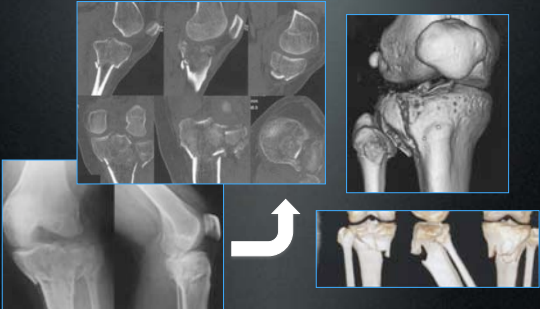
- ✓ LIGAMENTOTAXIS



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# PRE-OP DIAGNOSIS

- ✓ X-Ray, CT / 3D RECONSTRUCTION



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## PRE-OP DIAGNOSIS

✓ **FRACTURE CLASSIFICATION**

**Schatzker**

**Meyers - McKeever**

**AO**

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## STAGED MANAGEMENT

WAITING FOR SWELLING REDUCTION

↓

AVOID POST-OP COMPLICATION

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- ✓ **REDUCE SOFT-TISSUE PROBLEMS**
- ✓ **REDUCE INFECTION RATE**
- ✓ **REDUCE STIFFNESS**

*Egol et al, J Orthop Trauma 2005*

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## SURGICAL APPROACH

THE MORE APPROPRIATE TO OBTAIN GOOD VIEW AND REDUCTION

**STANDARD**

**MINIMALLY INVASIVE**

**ARTHROSCOPIC**

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## RESULTS

ARTHROSCOPIC TREATMENT OF COMPLEX FRACTURES

- ✓ **NO GOOD CORRECTION (5/18)**
- ✓ **WOUND PROBLEMS**
- ✓ **PARESTHESIA OVER LATERAL CULF**

*Chan et al, Arch Orthop Trauma Surg 2008*

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## REDUCTION

APPROPRIATE TO OBTAIN THE MORE ANATOMIC AND STABLE CONSTRUCT

- ✓ **ALLOWS EARLY MOBILIZATION WITH LESS PAIN AND SMOOTHNESS**

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## HARDWARE

THE LESS THAT ALLOWS STABILITY REDUCING RISK OF NECROSIS OR NON UNION

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## HARDWARE

**DIFFERENT PLATES  
DIFFERENT SCREWS  
EXTERNAL FIXATOR**

} **ALONE OR COMBINED**

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## RESULTS

**DOUBLE SCREW FIXATION  
BIOMECHANICALLY  
AS GOOD AS  
SCREW-PLATE FIXATION**

**FOR LATERAL TIBIAL  
PLATEAU FRACTURES**

Boisrenoult et al, Rev Chir orthop 2000

## RESULTS

**PERCUTANEOUS REDUCTION AND CIRCULAR FIXATOR  
BETTER THAN  
OPEN REDUCTION INTERNAL FIXATION**

Parameter	Standard Open Reduction and Internal Fixation* (N = 40)	Circular Fixator (N = 43)	P Value
Mean total operative time (min)	183	170	0.229
Mean tourniquet time (min)	96	48	0.001
Mean blood loss (mL)	544	213	0.006
Meniscal repair (no. of knees)	12	2	0.008
Cruciate ligament surgery (no. of knees)	10	4	0.436
Hospital stay† (days)	23.4 ± 3.8	9.9 ± 1.6	0.024

\*The values are given as the mean and the standard deviation.

Canadian Orthop Trauma Soc et al, JBJS Am 2006

## RESULTS

**PERCUTANEOUS REDUCTION AND CIRCULAR FIXATOR  
BETTER THAN  
OPEN REDUCTION INTERNAL FIXATION**

Parameter	Standard Open Reduction and Internal Fixation* (N = 40)	Circular Fixator† (N = 43)	P Value
Incision and drainage	8	2	
Split thickness skin graft	5	2	
Screw removal	0	6	
Knee manipulation	3	2	
Plate removal	8	0	
Total knee arthroplasty	2	1	
Above-the-knee amputation	1	0	
Soft tissue flap	4	0	
Revision open reduction and internal fixation	4	0	
Other	2	3	
Total	37	16	0.001

†The values are given as the number of reoperations.

Canadian Orthop Trauma Soc et al, JBJS Am 2006

## RESULTS

**PERCUTANEOUS REDUCTION AND CIRCULAR FIXATOR  
BETTER THAN  
OPEN REDUCTION INTERNAL FIXATION**

Parameter	Standard Open Reduction and Internal Fixation* (N = 40)	Circular Fixator (N = 43)	P Value
Range of motion* (deg)			
Flexion	113 ± 32	123 ± 15	0.114
Extension	4 ± 6	3 ± 6	0.699
Total arc of motion	109 ± 33	120 ± 19	0.091
Return to preinjury activity (no. who returned/total no. in group)			
0 mo	1/36	4/40	0.031
1 yr	2/35	10/37	0.024
2 yr	4/33	10/33	0.128
Mean HSS knee score†			
0 mo	61	72	0.064
1 yr	67	72	0.406
2 yr	68	75	0.307

\*The values are given as the mean and the standard deviation. †HSS = Hospital for Special Surgery.


Canadian Orthop Trauma Soc et al, JBJS Am 2006

## RESULTS

**HYBRID FIXATION vs INTERNAL FIXATION  
SYSTEMATIC ANALYSIS**

- ✓ **SOFT TISSUE CAREFULLY RESPECTED**
- ✓ **SLIGHT SUPERIOR RESULTS FOR HYBRID**
- ✓ **NO LONG-TERM STUDIES**
- ✓ **NEW LOCKING-PLATES PROMISING**

Mahadeva et al, Arch Orthop Trauma Surg 2008

**ARTICULATED EXTERNAL FIXATION** 

**A HINGED EXTERNAL FIXATOR ALIGNED ALONG KNEE FLEX-EXT AXIS**


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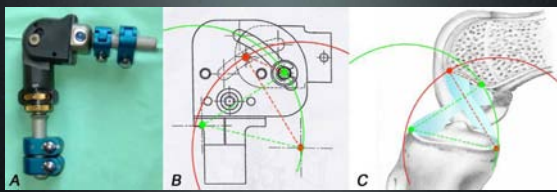
**POSSIBLE**

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**PHYSIOLOGIC MOTION WITHOUT HIGH STRESSES ON SURROUNDING STRUCTURES BUT WITH A LITTLE LIMITED ROM (0-90°)**

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**ARTICULATED EXTERNAL FIXATION** 




**INDICATIONS**

- ✓ **JOINT RECONSTRUCTION WITH MASSIVE BONE GRAFT**
- ✓ **COMMINUTED FRACTURES**
- ✓ **AFTER INFECTED PROSTHESIS REMOVAL**

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**ARTICULATED EXTERNAL FIXATION** 



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**ARTICULATED EXTERNAL FIXATION** 




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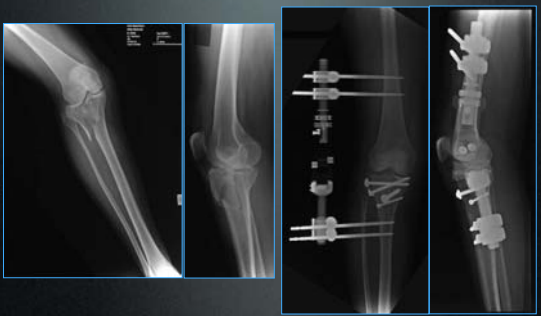
**ARTICULATED EXTERNAL FIXATION** 



**PASSIVE POST-OP. ROM**

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**ARTICULATED EXTERNAL FIXATION** 



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## ARTICULATED EXTERNAL FIXATION



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## POST-OP REHABILITATION

- ✓ DRAINS
- ✓ EARLY REHABILITATION
- ✓ ACTIVE MUSCLE EXERCISE
- ✓ LINFO DRENAGE
- ✓ WEIGHT BEARING



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# THANK YOU

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