

DIFFICULT PRIMARY TKR: THE STIFF KNEE

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THE STIFF KNEE

DEFINITION
A KNEE WITH LESS THAN A
50° ARC OF MOVEMENT

Aglietti 1989

THE STIFF KNEE

ETIOLOGY

- PRIMARY/IDIOPATHIC
- SECONDARY

- TO CONGENITAL PATHOLOGIES

- RACHYTERIA OSTEOGENERA
- OSTEOGENESIS IMPERFECTA
- ACHONDROPLASIA
- ARTHROGRYPOSIS
- HURLER'S DISEASE
- HUNTER'S DISEASE
- MORGUJON'S DISEASE
- MUSCULAR DYSTROPHY
- HYPOPLASIA OF THE LOWER LIMB
- CONGENITAL PSEUDARTHROSIS OF THE TIBIA
- HYPOPLASIA OF THE TIBIAL CONDYLES
- VEGICUS INTRAUTERINE POSITION
- BLUNT'S DISEASE

- TO ACQUIRED PATHOLOGIES

- CHRONIC INFLAMMATORY ARTHRITIS
- RHEUMATOID ARTHRITIS
- STILLIA DISEASE
- ANKYLOSING SPONDYLOARTHRITIS
- REITER'S DISEASE
- PSORIASIS ARTHRITIS
- SICKER'S DISEASE
- INFECTIVE ARTHRITIS
- OSTEOMYELITIS
- BRIDGES' ABSCESS
- TUBERCULOSIS (PUNNET GONITIS)
- PEDIATRIC CEREBRAL PALSY
- NEUROPATHIC CONDITIONS
- POLYMYELITIS
- TUMORS
- OSTEOARTHRITIS

- TO TRAUMA

- ORBITRICE FRACTURES
- EXTRA-ARTICULAR FRACTURES
- TIBIAL/FEMORAL METAPHYSIS
- TIBIAL/FEMORAL SHAPYTESIS
- ARTICULAR FRACTURES
- FEMORAL CONDYLES
- TIBIAL PLATEAUS
- PATELA
- KNEE DISLOCATIONS
- TO SURVIVOR'S SURVIVORS
- ACLR/PLCR
- EXTENSOR MECHANISM SURGERY
- HTD
- OFD
- PERIPROSTHETIC KNEE INFECTIONS

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PROGNOSTIC FACTORS FOR TKA IN PATIENTS WITH STIFF KNEES

THE MOST IMPORTANT FACTOR
PREDICTING POSTOPERATIVE ROM
WAS PREOPERATIVE ROM

Hsu 2012

COMPLICATIONS FOR TKA IN PATIENTS WITH STIFF KNEES

Complication	Number of knees
Skin edge necrosis	5 (6%)
Debridement and repeat closure	4
Skin graft	1
Pyogenic infection	3 (3.5%)
Debridement and exchange of tibial polyethylene liner	2
Removal of prosthesis and arthrodesis	1
Periprosthetic fracture (open reduction and internal fixation)	2 (2.3%)
Repaired quadriceps tendon (patient declined repair)	2 (2.3%)
Total	32 (44%)

Complications	No. of Patients
Extensor lag (<10°)	2 (5.1 %)
Flexion contracture(>10°)	8 (20.5 %)
Stiffness (arc of motion <30°)	2 (5.1 %)
Skin necrosis	3 (7.7 %)
Deep infection	1 (2.6 %)
Instability with patella baja	1 (2.6 %)

Hsu 2012

Kim 2009

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SISTEMATIC REVIEW

COMPLICATION RATE 14%

Authors	Number of knees	Mean followup (range in years)	Knee scores		Range of motion		Complication rate/revision
			Preoperative	Postoperative	Preoperative	Postoperative	
Aglietti et al. [1]	20	4.5 (2.5-7.5)	HSS 34 points	74 points	32°	78°	NS
Hsu et al. [3]	64	4.2 (2-10)	KS 34.2 points	80.5 points	34°	93°	2/64 (3%)
McAuley et al. [18]	27	6 (2.3-11.8)	NA	NS	30°	74°	11/27 (41%) (18.5%)
Montgomery et al. [19]	79	5.3 (2-12)	NA	80 points	36°	93°	4/79 (5%) (revision 0%)
Mullen et al. [21]	11	3.5 (2-5)	NA	NS	30°	103°	4/79 (5%) (revision 0%)
Rajgopal et al. [24]	72	9 (4-15)	KS 14.6	75.2	14°	75°	3/72 (4%) (revision 0%)
Spore et al. [27]	28	4.3 (1-12)	KS 25	77	47.5°	93.5°	6/28 (21%) (revision 0%)
Current authors	86	9.1 (5-12)	HSS 42	84	40°	102°	12/86 (14%) (revision 1%)
			KS 11	90			

HSS = Hospital for Special Surgery; KS = Knee Society; NA = not available.

SKIN NECROSIS 6%: NEED FOR SPECIAL CARE IN
HANDLING SKIN FLAPS, SOMETIMES A MUSCLE
FLAP OR A SKIN GRAFT REQUIRED BEFORE TKA

Kim et al, CORR 2009

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THE STIFF KNEE

ETIOLOGICAL CLASSIFICATION

- ✓ **DEGENERATIVE**
MOSTLY SOFT TISSUE DEFORMITY
- ✓ **POST-TRAUMATIC**
MOSTLY BONE DEFORMITY

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THE STIFF KNEE

FUNCTIONAL CLASSIFICATION

**FLEXION STIFFNESS
(FLEXION DEFICIT)**

or

**FLEXION CONTRACTURE
(EXTENSION DEFICIT)**

Bradley 1987
Mullen 1983

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FLEXION STIFFNESS

DEFINITION
INABILITY TO ACHIEVE
FULL PASSIVE FLEXION



NOT COMMON
AS FLEXION
CONTRACTURE
BEFORE TKA

Tew 1987
Cloutier 1999

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FLEXION STIFFNESS IN KNEE OA IS USUALLY PRODUCED BY

- ✓ **QUADRICEPS CONTRACTURE**
- ✓ **HETEROTOPIC OSSIFICATION**
- ✓ **PATELLA BAJA**
- ✓ **SOFT-TISSUE ADHESIONS**
- ✓ **COMBINED**

USUALLY POST-TRAUMATIC OA !!

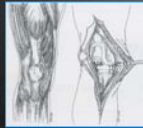
Rajgopal 2005

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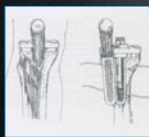
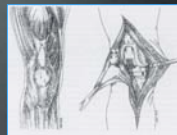


TECHNICAL OPTIONS TO ACHIEVE FLEXION

QUADRICIPITAL "SNIP"



QUADRICIPITAL V-Y PLASTY



OSTEOTOMY OF THE
TIBIAL TUBERCLE

OUR
CHOICE

Sculco 2001

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TECHNICAL KEY-POINTS

THE TIBIAL TUBEROSITY SHOULD BE
OSTEOTOMIZED TO PROTECT THE PATELLAR
TENDON IN CASE OF SEVERE STIFFNESS

Massin 2009

	Yes (n = 51)	No (n = 34)	P
Age (yr)	60	57	.89
Sex (male/female)	05/9	4/30	1.00
Diagnosis (OA/RA/trauma/other)	17/12/1	17/16/1/0	<.05
Preoperative arc of motion (deg)	14	58	<.05
Preoperative knee score (patist) ^a	41	32	.33
Preoperative function score (patist)	8	11	.86
Postoperative arc of motion (deg)	79	96	.19
Postoperative knee score (patist)	72	81	<.05
Postoperative function score (patist)	18	44	<.05
Postoperative extension lag (°/10°)	2	0	<.05

OA indicates osteoarthritic RA, rheumatoid arthritis.
^a KS functional evaluating system.

THE V-Y
QUADRICEPSPLASTY
WAS ASSOCIATED WITH
A GREATER POST-
OPERATIVE EXTENSION
LAG AND INFERIOR
CLINICAL OUTCOME

Hsu 2012

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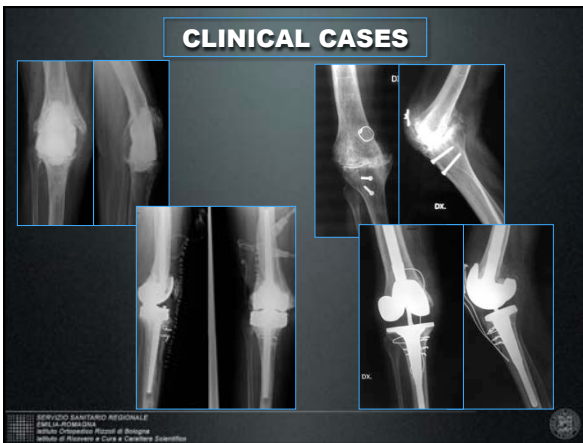
OUTCOMES

Study	Year	Study/Condition	Outcomes	Comments
Anderson et al ¹¹	10	Revision of the total knee and hip	All treated	Complications in 3 patients
Choi and Bostrom ¹²	10	Prosthetic SLD	Average 27 month follow-up of 12 patients were included	4 major and 4 minor joint complications
Choi et al ¹³	8	Total and partial revision	All treated	Bone graft used in all patients
Frederick ¹⁴	3	Distal femur fracture (D, distal femur fracture (D)	4 grafts, 1 joint	Extensive leg in all patients, 1 revision
Lawson et al ¹⁵	20	Prosthetic SLD	Average 38 post-operative knee flexion range of motion from 90° flexion to 120° extension from 90° flexion to 120° extension	57% needed manipulation from 90° flexion to 120° extension, 10% needed hip and 2% needed shoulder surgery
Lawson et al ¹⁶	16	Distal femur fracture	Average 48 month follow-up. Mean knee flexion range of motion improved from 92° pre to 107° post	4 secondary revision, 1 revision primary, 1 revision
Price et al ¹⁷	2	Stagnant knee flexion	Excluded	Case report
Price et al ¹⁸	11	Total patella fracture	49% knee flexion improved from 90° pre to 107° post	20% infection rate, 2.8% DVT rate
Shanger et al ¹⁹	10	Distal femur fracture	Average knee flexion improved from 90° pre to 107° post	4% bone and cartilage in 10% of patients, 14.3%
Thompson et al ²⁰	47	Distal femur fracture	Mean 42 month follow-up. Mean knee flexion range of motion improved from 92° pre to 107° post	10% infection rate, 10% revision rate, 10% revision rate
Price et al ²¹	10	Total patella fracture	75% joint to another study, 20% joint to knee	10% intraoperative complication rate, 20% joint to knee
Thompson et al ²²	14	Distal femur	94% patella fracture at 1 yr	90% intraoperative complication rate, 20% joint to knee
Price et al ²³	10	Prosthetic SLD	Average 30 month follow-up. Mean knee flexion range of motion improved from 90° pre to 107° post	4 bone mass with MRI, 1 infection, 1 revision, 1 revision
Price et al ²⁴	10	Total knee replacement and distal femur fracture	Mean knee flexion range of motion improved from 92° pre to 107° post	1 infection, 1 revision, 1 revision

OUTCOMES FOR TKA AFTER PREVIOUS FRACTURE ARE INFERIOR TO THOSE FOLLOWING PRIMARY TKA FOR OA

COMPLICATION REPORTED IN 57% CASES

Bedi 2009



FLEXION CONTRACTURE

DEFINITION
INABILITY TO ACHIEVE FULL PASSIVE EXTENSION

FLEXION CONTRACTURE IS A COMMON DEFORMITY BEFORE TKA
61% OF TKAs

Tew 1987
Cloutier 1999

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FLEXION CONTRACTURE IN KNEE OA IS USUALLY PRODUCED BY

- ✓ BONE IMPINGEMENT
- ✓ SOFT TISSUE SHORTENING
- ✓ COMBINED

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ORIGIN OF FLEXION CONTRACTURE IN OA KNEE

- ✓ POSTERIOR FEMORAL OSTEOPHYTES
- ✓ ANTERIOR TIBIAL OSTEOPHYTES
- ✓ NOTCH OSTEOPHYTES
- ✓ PCL RETRACTION
- ✓ POSTERIOR CAPSULE RETRACTION
- ✓ COLLATERAL LIGAMENTS RETRACTION
- ✓ HAMSTRINGS RETRACTION
- ✓ GASTROCNEMIUS RETRACTION
- ✓ BICEPS FEMORIS RETRACTION

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FLEXION CONTRACTURE

TREATMENT DEPENDS ON SEVERITY OF CONTRACTURE

CLASSIFICATION OF FLEXION CONTRACTURE

MILD	5° - 15°
MODERATE	15° - 30°
SEVERE	> 30°

Bellemans 2006
Scuderi 2007
Ritter 2007

Font-rodriguez 1997
Robertson 2000
Roberts 2007

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TREATMENT

MILD CONTRACTURE (<15°)

- ✓ STANDARD BONE RESECTION
- ✓ MEDIOLATERAL BALANCING
- ✓ OSTEOPHYTES REMOVAL
- ✓ ADDITIONAL DISTAL FEMUR RESECTION (+ 2mm)

IT IS MANDATORY TO OBTAIN INTRA-OP

- ✓ FLEX-EXT GAPS EQUAL AND SIMMETRICAL
- ✓ FULL EXTENSION

RESIDUAL FLEXION CONTRACTURE WILL NOT IMPROVE OVERTIME!

Laskin 2004
Scuderi 2006



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TREATMENT

MODERATE CONTRACTURE (15°- 30°)

ADDITIONAL POSTERIOR CAPSULE RELEASE IS NECESSARY

- ✓ COMPLETE PCL RELEASE
- ✓ SUBPERIOSTEAL ELEVATION FROM POSTERIOR FEMORAL CONDYLES (1-2 cm)





**IF FLEX-EXT GAPS MISMATCH IS PRESENT
ADDITIONAL DISTAL FEMUR RESECTION
UP TO A MAXIMUM OF 4 mm**

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TREATMENT

MODERATE CONTRACTURE (15°-30°)



**DISTAL FEMUR OVERRESECTION
MAY ELEVATE JOINT LINE**


ELEVATION < 10 mm
ACCEPTABLE
WITH PS IMPLANT

SMALLER POLYETHYLENE
(to correct residual flexion deformity)

↓

**FLEXION INSTABILITY
(also with PS implant)**

CONSIDER MORE CONSTRAINED IMPLANT




Lombardi 1996

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TREATMENT

SEVERE FLEXION CONTRACTURE (>30°)

- ✓ SUBPERIOSTEAL RELEASE OF MEDIAL AND/OR LATERAL GASTROCNEMIUS HEAD OFF POSTERIOR FEMUR
- ✓ CAREFUL TRANSVERSE SECTIONING OF POSTERIOR CAPSULE
- ✓ RISK OF POPLITEAL ARTERY AND VEIN DAMAGE
- ✓ BICEPS TENOTOMY (RISK PERONEAL NERVE PALSY)



Bellemans 2006
Omeroglu 2001
Schinsky 2001




Insall 1979
Laskin 1988

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JOINT RECONSTRUCTION

IMPLANT CHOICE

- ✓ AVOID PCR PROSTHESIS
- ✓ BE PREPARED TO USE DIFFERENT TYPE OF PROSTHESIS

PS PRIMARY PROSTHESIS

CONSTRAINED PROSTHESIS

HINGE PROSTHESIS

ACHIEVE A STABLE KNEE WITH THE LEAST AMOUNT OF IMPLANT CONSTRAIN

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PRE-OP FLEXION CONTRACTURE AFFECTS POSTOPERATIVE OUTCOME

↓

PAIN SCORES, FUNCTION SCORES AND KSS ARE REDUCED RESPECT TO KNEES WITH NORMAL EXTENSION

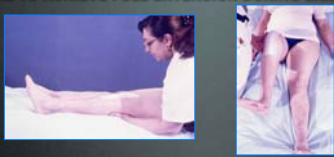
THE GREATER THE DEFORMITY

↓

THE HIGHER THE RISK OF POSTOPERATIVE RESIDUAL DEFORMITY

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TO PREVENT DEFORMITY RECURRENCE
ESSENTIAL TO ACHIEVE FULL EXTENSION DURING EARLY REHABILITATION



MOST FLEXION CONTRACTURE STRETCH OUT WITH TIME AND IMPROVE UP TO 3 YEARS AFTER TKA

IF RECURRENT DEFORMITY IS OBSERVED

EXTENSION BRACE OR PLASTIC CAST MAY BE USED



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CONCLUSION

STIFF KNEE

- ✓ **COMBINED WITH OTHER DEFORMITIES**
- ✓ **DEALT WITH SEQUENTIAL SURGICAL STEPS**
- ✓ **FULL CORRECTION AT INITIAL TKA**
- ✓ **CUSTOMIZED PHYSICAL THERAPY**
- ✓ **FREQUENT F.U. CONTROL**

**KEEP IN MIND:
 RESIDUAL CONTRACTURE
 =
 POOR FUNCTIONAL OUTCOME**

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