



Efficacy of braces in ACL deficient knee



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Knee Bracing

By purpose, this lecture is focus on the role of braces on ACL deficient and reconstructed knee

- ✓ Early return to sport?
- ✓ Prevent rupture or re-rupture?

Mechanical?
Proprioceptive?
Psychological?


AOSSM survey Decoster, Orthopaedics 2003 76% among 1194 members

- ✓ Unstable knee
 - ✓ 97% prescription of custom made braces
 - ✓ 3% no splint at all
- ✓ After reconstruction (post-op & @ long term)
 - ✓ Only 13% without any brace
- ✓ Use dramatically decrease since 5 years ++
 - ✓ 50% of surgeons

Presently : empirical use


Knee Braces

- ✓ Prophylactic
 - ✓ Should avoid ligament lesion
- ✓ Functional
 - ✓ Facilitate normal kinematics in the ACL-deficient ACL-R knee. It should provide stability.
- ✓ Rehabilitative
 - ✓ Control and protect ROM
- ✓ Offloader
- ✓ Patellofemoral
- ✓ Sleeve



Bridge, Tech Knee Surg 2008

Knee Bracing

- ✓ Functional & prophylactic knee braces
 - ✓ Mechanical roles
 - ✓ Single lateral upright (rigid arm)
 - ✓ Hinge
 - ✓ Single, polycentric
 - ✓ Prohibited in team contact sports
- ✓ Sleeve
 - ✓ No rigid structure (neopren)
 - ✓ Quite similar as taping...

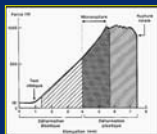
Healthy Knee : Mechanical Protection? Epidemiological survey

- ✓ Efficacy controversial in sport practice / MCL
 - ✓ Yes Sitler, Am J Sport Med 1990
 - ✓ NFL Defender, custom made brace
 - ✓ No Teitz, JBJS Am 1987
Albright, Am J Sport Med 2003
 - ✓ Bias in these studies (population, musculature,...)
- ✓ Non conclusive for ACL
 - ✓ Even if valgus stress is part of the ACL tear mechanisms...

Najibi & Albright, Am J Sport Med 2005

Healthy Knee : Mechanical Protection? Experimental studies

- ✓ Resistance to valgus force increased by 30%
- ✓ Proportional
 - ✓ Brace tightening
 - ✓ Length of lateral uprights
- ✓ Decrease with flexion
- ✓ ACL is not protected when speed increases
- ✓ Forces @ tests < real Traumas +++



France, *Am J Sport Med* 1987
Brown, *Clin Sport Med* 1990
Meyer, *Iowa Orthop J* 1989
Erickson, *Am J Sport Med* 1993

ACL Deficient Knee: Mechanical Protection? Experimental studies

- ✓ Reduce the strain values in anterior directed loading up to 140 N
 - ✓ Weight and non weight bearing knees
 - ✓ Infraphysiological !!
- Beynon, *JBS Am* 1992 , *Am J Sport Med* 2003
- ✓ Control uncomplete
 - ✓ In vivo @ hight demanding tasks (including pivot)
- ✓ Custom braces more efficient
 - Liu, *J Rehabil Res Dev* 1999
 - Beynon, *JBS Am* 1992 , *Am J Sport Med* 2003
 - Wojtys, *Am J Knee Surg* 2001



ACL Deficient Knee: Functional Protection?

- ✓ Objectively & subjectively beneficial
 - ✓ Physical tests (running with pivoting, jump...)
 - ✓ Clinically (swelling, giving way...)
 - ✓ Laximetry (Telos,KT1000) slight effect < 89 N
- ✓ If quad capacity < 80% +++
- ✓ This beneficial effect drops down as the level of activity increases

Colville, *Am J Sport Med* 1986
Cook, *Am J Sport Med* 1989
Mishra, *Clin Orthop* 1989

ACL R Knee: Functional Protection?

- ✓ Brace vs unbraced @ all postop phases = NS
- Risberg, *Am J Sport Med* 1999
- ✓ Brace vs unbraced @ re athetization = NS
- Harilainen & Kartus, *Knee Surg Sport Trauma Arthro* 1997
- ✓ Meta analysis = NS
- Martinek & Friederich, *Orthopade* 1999
- ✓ Mid term (up to 2y) sleeve vs braces NS
 - ✓ Birmingham & al, *Am J Sport Med* 2008
- ✓ Subjective improvement
 - Mc Devitt, *Am J Sport Med* 2004
 - ✓ Proprioceptive or psychological effets?

Proprioceptive role of braces

- ✓ Normal knee
 - ✓ Isokinetic test joint position without visual control
 - ✓ Improved by 11% (p > 0,05)
- Mac Nair, *Arch Phys Med Rehab* 1996
- ✓ ACL deficient knee
 - ✓ Decrease muscular activity EMG (Quad & amstrings)

Branch, *Am J Sport Med* 1989
Nemeth, *Am J Sport Med* 1997
Ramsey, *Clin Biomech* 2003


Proprioceptive role of braces

- ✓ ACL reconstructed knee
 - ✓ Beneficial @ short term
 - ✓ Simple tests with visual control (p = 0,02)
 - Birmingham, *Med Sci Sport Exerc* 2001
 - ✓ Improve muscular coordination & reactivity
 - Rebel, *Knee Surg Traum Arthr* 2001
 - ✓ Individually custom braces (expansive!)
- NS @ long term
 - ✓ Thresholds for static nor dynamic tests on
 - Risberg, *Am J Sport Med* 1999



But : Brace Disadvantages

- ✓ **Problem of fixation**
 - ✓ Loose efficacy with intra-muscular pressure
Styf, Am J Sport Med 1992
- ✓ **Practical daily use in sport**
 - ✓ Speed and mobility limitation
Greene, Am J Sport Med, 2000
Paluska, Am Fam Physician, 2000
- ✓ **Performances drop down**
 - ✓ Quad Isokinetic tests
 - ✓ Quad Atrophy & increase O₂ consumption
Risberg, Am J Sport Med 1999
Highgenboten Am J Sport Med 1991
Wu, Arch Phy Med Rehab 2001



Sleeves Proprioceptive effects

- ✓ **Improve static proprioception**
 - ✓ Simple taping up to 25% *Perlau, Am J Sport Med 1995*
 - ✓ More effective in deficient knee *Barret, JBJS 1991*
 - ✓ Influence afferent neural input
- ✓ **Improve dynamic proprioceptive tests**
 - ✓ Sleeve or taping (p<0,05) *Herrington, Res Sport Med 2005*
- ✓ **Much more > ACL reconstruction (p<0,001)**
Kuster, Med Sc Sport Exerc 1999



- ✓ **Our study taping vs nothing > ACLR (120 consecutive patients)**
 - ✓ IKDC A or B & Pivot sport
 - ✓ Mothadi score
 - ✓ Return to sport @ 3 mths facilitated (P=0,02)
- ✓ **Giotis & al KSSTA 2011 normal knee bracing**
 - ✓ Prophylactic braced vs patellar brace vs unbraced
 - ✓ Functional tests : rotation / demanding activities
 - ✓ Prophylactic brace improve stability (p<0,001)
 - ✓ Patellar brace / unbraced (p= 0.021)

CONCLUSION

- ✓ **False safety of functional braces**
 - ✓ Useless to protect the ligaments
 - ✓ Could be proposed for unstable knee / special situation (e.g. sport event)
 - ✓ Frank laxity (AP or lateral)
 - ✓ Waiting for surgery
 - ✓ Useless before return to sport after ACLR
- ✓ **Main goal = improve confidence**
 - ✓ Increased proprioception
 - ✓ Taping or simple sleeve
- ✓ Proprioceptive sleeve



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