

# Jumpers knee

Myles Coolican  
Val d'Isere 2014



Sydney Orthopaedic  
Research Institute  
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## Jumpers Knee- Overview

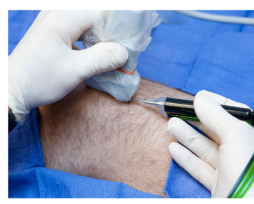
Background information patellar tendinopathy

- Structure of PT
- Pathophysiology
- Prevalence
- Risk factors
- Imaging

Non Operative management

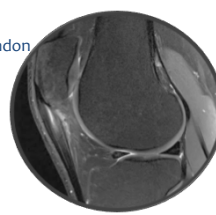
- Newer injectables
  - do they work
  - what is the evidence

Surgery





## Jumper's knee

- \* Jumping athletes –Martin Blazina 1973
- \* Anterior knee pain and tenderness
- \* Patellar tendinopathy
- \* Proximal, central, posterior portion of tendon



- \* Aetiology
  - \* Overuse
  - \* High impact ballistic loading
  - \* Tensile Load
  - \* Patellar Impingement

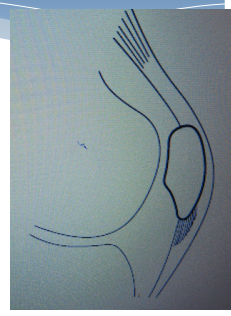

\* Blazina M, Kerlan R, Jobe F, et al: Jumper's knee. Ortho Clin North Am 6:665-678, 1973



## Jumper's knee

- \* Lesion is proximal posterior central
- \* Why here-----Unknown
- \* Theories

Posterior impingement  
Greater load  
Fibres here are shorter but with similar elongation under load  
Hamilton-adaptive response to compression loads

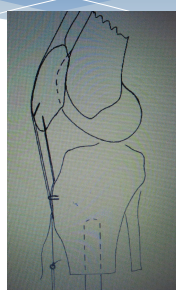




## Loads on patellar tendon

Andrew Amis

- \* Applied 1kN to 10 cadaver knees-strain

	Anterior	Posterior
10	3.9%	4.9%
60	2.7%	4.6%
90	1.7%	3.2%





## Pathophysiology

Repetitive overload

- \* Microscopic tears
- \* Mucoïd degeneration
- \* Fibrinoid necrosis
- \* Collagen separation / collagen degeneration \*
- \* Regional variation in vascularity / neovascularity
- \* Pain mediated by glutamate and other non-prostaglandin pathways \*\*

\* Khan K et al. Histopathology of common tendinopathies. Update and implications for clinical management. Sports Med. 1993;15(3):399-408.  
\*\* Alfredson H et al. In vivo microdialysis and immunohistochemical analyses of tendon tissue demonstrated high amounts of free glutamate and glutamate NMDA/R receptors, but no signs of inflammation, in jumper's knee. J Orthop Res. 2001;19(5):881-886.



## Prevalence

### Prevalence of Jumper's Knee Among Elite Athletes From Different Sports

#### A Cross-sectional Study

Oystein B. Lian,<sup>1</sup> MD, Lars Engebretsen,<sup>1,2</sup> MD, PhD, and Roald Bahr,<sup>3,4</sup> MD, PhD  
 From the <sup>1</sup>Oslo Sport Trauma Research Center, Norwegian University of Sport and Physical Education, Oslo, Norway, <sup>2</sup>Kristiansund Hospital, Kristiansund, Norway, and the <sup>3</sup>Orthopaedic Center, Ullevål University Hospital, Oslo, Norway

613 Norwegian national elite athletes  
 50 symptomatic  
 Oslo, Norway  
 2005

Lian OB, Engebretsen L, Bahr R. Prevalence of jumper's knee among elite athletes from different sports: a cross-sectional study. *Am J Sports Med.* 2005;33(4):561-567.

## Prevalence

- \* Overall prevalence 14%
- \* Previous symptoms 8%
- \* Career prevalence 22%
- \* Male 2 : 1 Female
- \* Variations between sports
- \* Duration of symptoms  
 \* 32 ± 25 months

Lian OB, Engebretsen L, Bahr R. Prevalence of jumper's knee among elite athletes from different sports: a cross-sectional study. *Am J Sports Med.* 2005;33(4):561-567.

## Risk Factors

### Risk factors for patellar tendinopathy: a systematic review of the literature

Henk van der Worp,<sup>1</sup> Mathijs van Ark,<sup>1</sup> Saskia Roerink,<sup>2</sup> Gert-Jan Pepping,<sup>2</sup> Inge van den Akker-Scheek,<sup>1</sup> Johannes Zwerver<sup>1</sup>

- \* Weight
- \* Height
- \* Weight training
- \* Jump training
- \* Waist-to-hip ratio

- \* Leg length difference
- \* Arch height of foot
- \* Quads flexibility
- \* Hamstring flexibility
- \* Quads strength

Lian OB, Engebretsen L, Bahr R. Prevalence of jumper's knee among elite athletes from different sports: a cross-sectional study. *Am J Sports Med.* 2005;33(4):561-567.  
 Van der Worp H et al. Risk factors for patellar tendinopathy: a systematic review of the literature. *Br J Sports Med* 2011; 45: 446-452

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 Van der Worp H et al. Risk factors for patellar tendinopathy: a systematic review of the literature. *Br J Sports Med* 2011; 45: 446-452

## Risk Factors

Jumping Sports

Lian OB, Engebretsen L, Bahr R. Prevalence of jumper's knee among elite athletes from different sports: a cross-sectional study. *Am J Sports Med.* 2005;33(4):561-567.

## Imaging

### Comparative Accuracy of Magnetic Resonance Imaging and Ultrasonography in Confirming Clinically Diagnosed Patellar Tendinopathy

Stuart J. Warden,<sup>1,2</sup> BPhysio (Hons), PhD, Zoltan S. Kesz,<sup>3</sup> MBBS, FRANZCR, Frank A. Malara,<sup>4</sup> MBBS, FRANZCR, Alistair B. T. Ooi,<sup>5</sup> Jill L. Cook,<sup>6</sup> BAppSci (Physio), PhD, and Kay M. Crossley,<sup>7</sup> BAppSci (Physio), PhD  
 From the <sup>1</sup>Department of Physical Therapy, School of Health and Rehabilitation Sciences, Indiana University, Indianapolis, Indiana, <sup>2</sup>Centre for Health, Exercise and Sports Medicine, School of Physiotherapy, The University of Melbourne, Melbourne, Victoria, Australia, <sup>3</sup>Department of Radiology, Mercy Private Hospital, Melbourne, Victoria, Australia, <sup>4</sup>Victoria House Medical Imaging, Prahran, Victoria, Australia, <sup>5</sup>Department of Radiology, Austin Health, Heidelberg, Victoria, Australia, and <sup>6</sup>Musculoskeletal Research Centre, School of Physiotherapy, La Trobe University, Bundoora, Victoria, Australia

Warden S et al. Comparative accuracy of magnetic resonance imaging and ultrasonography in confirming clinically diagnosed patellar tendinopathy. *Am J Sports Med* 2014;42:439-447.

## Imaging

MRI V Ultrasound

- \* Level 2 evidence – Cohort Study
- \* 30 clinical patellar tendinopathy
- \* 33 asymptomatic, activity matched

- \* MRI
- \* GS-US Grayscale Ultrasound
- \* CD-US Colour Doppler Ultrasound

Warden S et al. Comparative accuracy of magnetic resonance imaging and ultrasonography in confirming clinically diagnosed patellar tendinopathy. Am J Sports Med 35:427-436, 2007

## Imaging

MRI V Ultrasound

- \* Ultrasound more accurate than MRI to confirm clinically diagnosed patellar tendinopathy
- \* GS-US greatest sensitivity
- \* CD-US indicated likelihood of being symptomatic

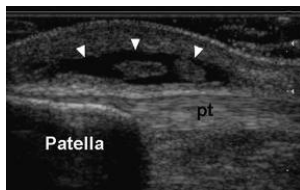
Variable	MRI <sup>a</sup>	GS-US <sup>b</sup>	McNemar Test
Asymptomatic (present/absent)	6/27	7/26	—
Symptomatic (present/absent)	17/13	26/4	—
Accuracy (%)	70 (60-83)	83 (73-92)	0.04*
Sensitivity (%)	87 (37-78)	87 (69-96)	0.01*
Specificity (%)	82 (65-93)	82 (65-93)	1.00
Positive predictive value (%)	74 (52-90)	81 (64-93)	—
Negative predictive value (%)	68 (51-81)	87 (70-96)	—
Likelihood of positive test result	3.1 (1.4-6.9)	4.8 (2.3-9.9)	—
Likelihood of negative test result	0.5 (0.3-0.8)	0.2 (0.1-0.4)	—

Warden S et al. Comparative accuracy of magnetic resonance imaging and ultrasonography in confirming clinically diagnosed patellar tendinopathy. Am J Sports Med 35:427-436, 2007

## Imaging

MRI V Ultrasound

- \* Need a good radiologist
- \* How often do we see an US film on screen in OR?



Warden S et al. Comparative accuracy of magnetic resonance imaging and ultrasonography in confirming clinically diagnosed patellar tendinopathy. Am J Sports Med 35:427-436, 2007

## Clinical scoring system

- \* Victorian Institute of Sport Assessment (VISA) Score

**The VISA Score: An Index of Severity of Symptoms in Patients with Jumper's Knee (Patellar Tendinosis)**

Paul J Visentini<sup>1</sup>, Karim M Khan<sup>1,2</sup>, Jill L Cook<sup>1,3</sup>, Zoltan S Kiss<sup>4</sup>, Peter R Harcourt<sup>5</sup> & John D Wark<sup>1</sup>

for the Victorian Institute of Sport Tendon Study Group

<sup>1</sup>The University of Melbourne (Department of Medicine-RMH), Parkville;  
<sup>2</sup>The University of British Columbia, Vancouver, Canada (School of Human Kinetics);  
<sup>3</sup>Griffiths University (Faculty of Science), Gold Coast, Queensland;  
<sup>4</sup>East Melbourne Radiology, Melbourne, Victoria;  
<sup>5</sup>Victorian Institute of Sport, South Melbourne, Victoria, Australia

### VICTORIAN INSTITUTE OF SPORT ASSESSMENT SCALE

1. For how many minutes can you sit pain-free? POINTS

2. Do you have pain walking downstairs with a normal gait cycle? POINTS

3. Do you have pain at the knee with full active knee weight bearing knee extension? POINTS

4. Do you have pain when doing a full weight bearing lunge? POINTS

5. Do you have problems squatting? POINTS

6. Do you have pain during or immediately after doing 10 single leg hops? POINTS

7. Are you currently undertaking sport or other physical activity? POINTS

8. Please complete items 1, 2, 3, 4, 5, 6 or 7 in this question.

9. If you have no pain while undertaking sport, but it does not stop you from completing the activity, please complete 0-20 only.

10. If you have pain that stops you from completing sporting activities, please complete 0-20 only.

TOTAL VISA SCORE   

Most Symptomatic 0 100 Asymptomatic

## Management

Universal agreement

- \* First 6 months
- \* Non operative treatment



Fig: Elattrache NS. Percutaneous Ultrasonic Tenotomy as a Treatment for Chronic Patellar Tendinopathy—Jumper's Knee. Operative Techniques in Orthopaedics. 2013;23(2):98-103

## Non Operative Management

- \* Avoidance of painful activities
- \* Physiotherapy
- \* NSAIDS
- \* Extra corporeal shock wave
- \* Low level laser
- \* Injections



Management of Chronic Tendon Injuries. www.aafp.org/afp

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## Non Operative Management

Physiotherapy

- \* Eccentric strengthening program
- \* Therapeutic Ultrasound
- \* Iontophoresis-electricity deliver
- \* Phonophoresis-US deliver
- \* Topical nitroglycerine



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## Non Operative Management

Eccentric Quads V surgery

### SURGICAL TREATMENT COMPARED WITH ECCENTRIC TRAINING FOR PATELLAR TENDINOPATHY (JUMPER'S KNEE)

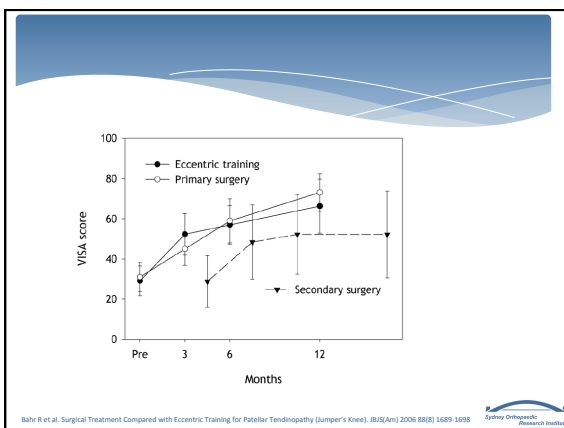
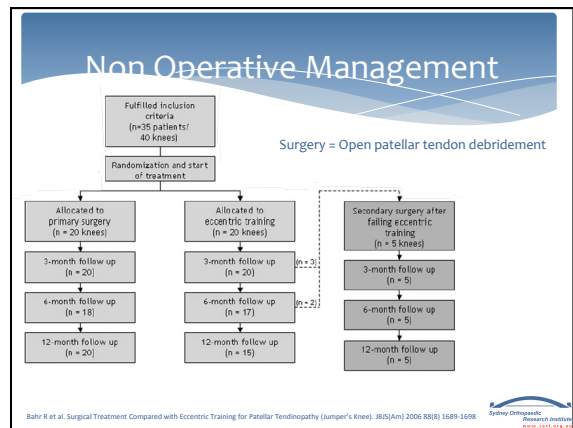
A RANDOMIZED, CONTROLLED TRIAL

BY ROALD BÄHR, MD, PHD, BJORN FOSSEN, PT, SVERRE LØKEN, MD, AND LARS ENGERBRETTSEN, MD, PHD

*Investigation performed at the Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences; the Health Department, Olympic Training Center; and the Department of Orthopaedic Surgery, Ullevål University Hospital, Oslo, Norway*

Bähr R et al. Surgical Treatment Compared with Eccentric Training for Patellar Tendinopathy (Jumper's Knee). JBS(Am) 2006;88(8):1689-1698

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## Non Operative Management


- \* No advantage of surgical treatment over eccentric exercise program
- \* Trial of eccentric exercises for 12 weeks before considering open tenotomy

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## Non Operative Management

NSAIDS

- \* Widespread use
- \* Little evidence of efficacy in chronic tendinopathy \*
- \* Associated risks
  - \* GI upset
  - \* Renal damage
  - \* Increased cardiovascular risk



\* Mehallo CJ et al. Practical management: nonsteroidal anti-inflammatory drug (NSAID) use in athletic injuries. Clin J Sport Med. 2005;6(2):170-174.

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## Non Operative Management

Injections

- \* Corticosteroid injection
- \* Prolotherapy-injections stimulate collagen
- \* Plasma Rich Platelet injections




Fig: Elattrache NS. Percutaneous Ultrasonic Tenotomy as a Treatment for Chronic Patellar Tendinopathy—Jumper's Knee. Operative Techniques in Orthopaedics. 2013; 23(2): 98-105.

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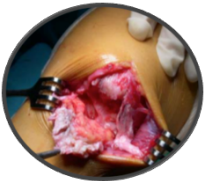
## Corticosteroid Injection

Arch Orthop Trauma Surg (2009) 129:369–377  
DOI 10.1007/s00402-008-0655-1

ARTHROSCOPY AND SPORTS MEDICINE

**Patellar tendon ruptures in weight lifters after local steroid injections**

Shen-Kai Chen · Cheng-Chang Lu · Pei-Hsi Chou · Lan-Yuen Gao · Wen-Lan Wu



- \* 7 weight lifters over a 2 year period
- \* Average of 9 steroid injections
- \* No other risk factors for rupture
- \* Mean loss of 8% of power of knee extension 2 years after surgical repair

Kaohsiung Medical University Hospital, Taiwan

Sydney Orthopaedic Research Institute

## US Guided Sclerosing treatment

**Ultrasound-Guided Sclerosing Treatment in Patients With Patellar Tendinopathy (Jumper's Knee)**

**44-Month Follow-up**

Aasne Heksrud,<sup>\*†</sup> MD, and Rosald Bahr,<sup>†</sup> MD, PhD  
Investigation performed at the Oslo Sports Trauma Research Center, Norwegian School of Sport Sciences, Oslo, Norway

Heksrud A, et al. Ultrasound Guided Sclerosing Treatment in Patients With Patellar Tendinopathy (Jumper's Knee) 44-Month Follow-up. AJSM 2011 39(11):2377-2380

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## US Guided Sclerosing Treatment

Prolotherapy



- \* Polidocanol injected into area of neovascularisation
- \* VISA score pre, 12, 44 months
- \* 29 patients
- \* 12 patients required arthroscopic surgery during f/u
- \* Effective for a little over half the patients
- \* Other patients had significant improvement in VISA score

Heksrud A, et al. Ultrasound-Guided Sclerosing Treatment in Patients With Patellar Tendinopathy (Jumper's Knee) 44-Month Follow-up. AJSM 2011 39(11):2377-2380

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## Platelet Rich Plasma

**Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper's Knee in Athletes**

Mario Vetrano,<sup>\*†</sup> MD, Anna Castorina,<sup>†</sup> MD, Maria Chiara Vulpiani,<sup>†</sup> MD, Rossella Baldini,<sup>†</sup> PhD, Antonio Pavan,<sup>§</sup> MD, and Andrea Ferretti,<sup>||</sup> MD  
Investigation performed at the Sant'Andrea Hospital, Sapienza University of Rome, Rome, Italy


Vetran M et al. Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper's Knee in Athletes. AJSM 2013 41(4): 795-803

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## Platelet Rich Plasma

- \* 46 consecutive athletes
- \* Randomized to 2 treatment groups
- \* 2 autologous PRP injections over 2 weeks
- \* 3 sessions of ESWT
  
- \* Both groups had significant improvement in symptoms
- \* No difference between groups at 2 months
- \* PRP group significantly better at 6 and 12 months

Vetrano M et al. Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper's Knee in Athletes. AJSM 2013 41(4) 795-803



## Platelet Rich Plasma


Better

- \* Filardo 2009 and 2013
- \* Kon 2008

Worse



- \* Bowman-2013 Pittsburgh  
3 patients worse

Vetrano M et al. Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper's Knee in Athletes. AJSM 2013 41(4) 795-803




## Surgical Management

- \* US guided percutaneous tenotomy
- \* Arthroscopic debridement
- \* Open debridement
- \* Combined arthroscopic and open debridement

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## Surgical Management




Operative Techniques in Orthopaedics

### Percutaneous Ultrasonic Tenotomy as a Treatment for Chronic Patellar Tendinopathy—Jumper's Knee


Neal S. Elattrache, MD,<sup>1</sup> and Bernard F. Morrey, MD<sup>1</sup>

Elattrache NS. Percutaneous Ultrasonic Tenotomy as a Treatment for Chronic Patellar Tendinopathy—Jumper's Knee. Operative Techniques in Orthopaedics. 2013 23(2):98-103

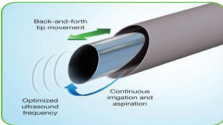


## Percutaneous Ultrasonic Tenotomy


	Percutaneous Ultrasound	Open Surgery
Duration of Symptoms	< 3 mo	1 y
Extent of intervention	Minimal	Extensive
Recovery	Rapid	Prolonged
Effectiveness	Predictable	Variable
Safety	Very	Very



16 patients  
15 "some level of improvement"  
10 "returned to prior level of competition"




Elattrache NS. Percutaneous Ultrasonic Tenotomy as a Treatment for Chronic Patellar Tendinopathy—Jumper's Knee. Operative Techniques in Orthopaedics. 2013 23(2):98-103



## Surgical Management

Open or Arthroscopic

- \* Longitudinal tenotomy
- \* Debride macroscopically abnormal tendon
- \* Inferior pole of patella excision
- \* Inferior pole of patella drilling / microfracture
- \* Paratenon repair / excision / leave open
- \* Fat pad excision
- \* Synovectomy
- \* Associated chondral / meniscal lesions



## Surgical Management

### Arthroscopic Management of Chronic Patellar Tendinopathy

Antonio Pascarella,\* MD, Mahbub Alam,<sup>†</sup> MRCS, MS, Fabio Pascarella,\* MD, Carmine Latte,\* MD, Mariano Giuseppe Di Salvatore,\* MD, and Nicola Maffulli,<sup>1§</sup> MD, MS, PhD, FRCS(Orth)  
*Investigation performed at the Laboratorio di Chirurgia Artroscopica, Isernia, Italy, and the Centre for Sports and Exercise Medicine, Queen Mary University of London, Bart's, and The London School of Medicine and Dentistry, Mile End Hospital, London, United Kingdom*

Pascarella, Antonio, et al. "Arthroscopic management of chronic patellar tendinopathy." *The American journal of sports medicine* 39:9 (2011): 1975-1983.

## Surgical Management

- 64 patients (73 knees) failed non-operative management
- 27 professional athletes
- Arthroscopic Debridement:
  - Fat pad
  - Patellar tendon
  - Lower pole of patella
- VISA scores improved significantly at 1,3,5 and 10 years.
- Return to sport at 3 months
- 19 of 27 elite athletes returned to same level of sport

Pascarella, Antonio, et al. "Arthroscopic management of chronic patellar tendinopathy." *The American journal of sports medicine* 39:9 (2011): 1975-1983.

## Surgical Management

ORIGINAL ARTICLE

### Surgical treatment of patellar tendinopathy in athletes. A retrospective multicentric study

T. Cucurulo, M.-L. Louis, M. Thauinat, J.-P. Franceschi\*

Hôpital de la Conception, 13005 Marseille, France

- 64 athletes recalcitrant to conservative management
- Average 22 month follow up
- 87% patients improved
- 63% returned to previous level of sport
- No difference between patellar resection and arthroscopy

Cucurulo, T et al(2009). Surgical treatment of patellar tendinopathy in athletes. A retrospective multicentric study. *Orthopaedics & Traumatology: Surgery & Research*, 95(8), 78-84.

## Surgical Management

CLINICAL ORTHOPAEDICS AND RELATED RESEARCH  
 Number 455, pp 102-106  
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### Surgical Treatment of Chronic Patellar Tendinosis

A Systematic Review

Christopher C. Kaeding, MD; Angela D. Pedroza, BS; and Bret C. Powers, DO

- Paucity of good quality research
- Highest level of evidence – Level IV (case series)
- Systematic Review
  - Surgical treatment of inferior pole of patella
  - Closure of paratenon
  - Immobilization

Kaeding CC, Pedroza AD, Powers BC. Surgical treatment of chronic patellar tendinosis: a systematic review. *Clin Orthop Relat Res*. 2007;455:102-106.

## Surgical Management

### Inferior Pole of Patella

Excise inferior pole of patella?  
 Impinging lesion

Drill the inferior pole?  
 Encourage blood flow / healing

More successful outcomes without bony work 97.1% V 70.9%

Kaeding CC, Pedroza AD, Powers BC. Surgical treatment of chronic patellar tendinosis: a systematic review. *Clin Orthop Relat Res*. 2007;455:102-106.

## Surgical Management

### Paratenon

Close the paratenon ?  
 Encourage healing

Excise the paratenon?  
 Remove pain fibres

More successful outcomes without closure 91.5 V 84.8% with closure

Kaeding CC, Pedroza AD, Powers BC. Surgical treatment of chronic patellar tendinosis: a systematic review. *Clin Orthop Relat Res*. 2007;455:102-106.

## Surgical Management


**Immobilization after surgery**

Utilized in 4 studies  
Success rate 84.8%

No immobilization in 4 studies  
Success rate 91.5%


More successful outcomes without immobilization

Kaeding CC, Pedroza AD, Powers BC. Surgical treatment of chronic patellar tendinosis: a systematic review. Clin Orthop Relat Res. 2007;455:102-106.



## Summary-jumpers knee

- \* Common in jumping sports
- \* Affects deep proximal patellar tendon
- \* Non operative management for first 6 months
- \* PRP and sclerosing injections can be effective
- \* Surgery reserved for failure of non op management
- \* Paucity of good studies confirming what aspect of surgery helps the patient



## Thank you

