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A cross sectional study of 100 athletes with jumper's knee managed conservatively and surgically

J L Cook, K M Khan, P R Harcourt, M Grant, D A Young, S F Bonar for the Victorian Institute of Sport Tendon Study Group

Abstract

***Objectives*—Jumper's knee causes significant morbidity in athletes of all standards. However, there are few reference data on the clinical course of this condition in a large number of patients, and the aim of this study was to rectify this.**

***Methods*—A retrospective study of the course of jumper's knee in 100 athletes who presented to a sports medicine clinic over a nine year period was carried out. Subjects completed a questionnaire designed to collect details of sport participation, symptoms, and time out of sport. Ultrasonographic results were recorded from the radiologists' reports. Histopathological results were obtained for patients who had surgery.**

***Results*—Forty eight subjects recalled that symptoms of jumper's knee began before the age of 20 years. Symptoms prevented 33 from participating in sport for more than six months, and 18 of these were sidelined for more than 12 months. Forty nine of the subjects had two or more separate episodes of symptoms. Ultrasonography showed a characteristic hypoechoic region at the junction of the inferior pole of the patella and the deep surface of the patellar tendon. Histopathological examination showed separation and disruption of collagen fibres on polarisation light microscopy and an increase in mucoid ground substance consistent with damage of tendon collagen without inflammation.**

***Conclusions*—Jumper's knee has the potential to be a debilitating condition for a sports person. About 33% of athletes presenting to a sports medicine clinic with jumper's knee were unable to return to sport for more than six months.**

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Keywords: patellar tendon; jumper's knee; tendinitis; tendinosis

Victorian Institute of Sport, Albert Road, South Melbourne, Australia 3205 and University of Melbourne, Parkville, Australia 3052
J L Cook
K M Khan
P R Harcourt
M Grant
D A Young
S F Bonar

Correspondence to:
Ms J Cook, VIS Tendon Study Group, Alphington Sports Medicine Clinic, 339 Heidelberg Road, Northcote, Australia 3070.

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The clinical entity of "jumper's knee" causes significant morbidity in elite and recreational sports people, particularly those participating in sports involving repeated jumping and landing, rapid acceleration and deceleration, cutting moves, and kicking,[1 2] such as basketball, volleyball, soccer, tennis, high jump, long jump, fencing, and track.[3–6] The term jumper's knee refers to anterior knee pain associated with tenderness of the patellar tendon near its patellar attachment.[4 7 8] In this paper we use jumper's knee to refer to the clinical syndrome in preference to patellar tendinitis, which falsely attributes pathology to clinical signs.

Conservative management of jumper's knee includes rest from aggravating activities together with concentric and then eccentric quadriceps strengthening exercises.[9 10] Various authors have recommended surgical management for patients whose symptoms have not resolved after six months of conservative management.[6 10–16] However, there are as yet no evidence based methods of managing jumper's knee either conservatively or surgically, and the outcome after treatment remains relatively unpredictable.[17]

The aim of this study was to review a large cohort of athletes with jumper's knee and describe the clinical course of the condition to provide baseline descriptive data for clinicians and also to stimulate research. As a secondary aim we examined tendon histopathology in a representative sample of patients who had received surgery.

Methods

All patients who had attended a sports medicine clinic during a nine year period and had been diagnosed by one of three sports physicians as having jumper's knee were sent a questionnaire to complete and return. A diagnosis of jumper's knee was made on clinical grounds: the presence of anterior knee pain with activity, especially on landing and sudden stopping, focal tenderness at the inferior pole of the patella, and the absence of other knee pathology. To ensure that patients with Sindig-Larsen-Johanssen syndrome were not inadvertently included in the series, all subjects who presented below the age of 16 years were excluded from the study. Subjects with tenderness in the mid or distal patellar tendon were also excluded.

Conservative management was recorded as including physiotherapy if patients attended a physiotherapy session on more than three occasions. Rest was included as a treatment if the athlete had rested from sport for more than two weeks. As this retrospective study was not designed to compare individual treatment methods with clinical outcome, we did not attempt to separate the various treatment components within physiotherapy—for example, exercise prescription, electrotherapy, massage.

Subjects who presented later in the series received sonographic treatment of the symptomatic side(s) by one of two radiologists using a high resolution linear array 7.5 MHz ultrasound transducer (Acoustic Imaging Dornier). Patients with sonographic abnormalities at the mid or distal patellar tendon were excluded from the study.

Patients reported their current status by their ability to return to sport at the previous level (yes/no) and by the presence or absence of symptoms (yes/no).

Operative specimens were obtained from 12 patients who had open patellar tenotomy. The specimens consisted of the macroscopically abnormal patellar attachment of the patellar tendon and corresponded to the area of abnormal signal on ultrasonography. One experienced musculoskeletal histopathologist (SFB) examined all cases. Specimens were stained using haematoxylin and eosin and Alcian blue, fixed using standard methods, and examined under both routine and polarised light microscopy. Results were reported descriptively according to the appearance of the collagen fibrils, the presence or absence of staining mucoid ground substance and the presence or absence of inflammatory cells.

Data were analysed using Statview+ 4.0 (Abacus Corp, Berkeley, CA, USA). Descriptive data were reported using mean and standard deviation.

Results

SUBJECT CHARACTERISTICS

One hundred and forty eight subjects met the entry criteria; 100 responded and were included in the study, 25 were not contactable and 23 chose not to respond. The 100 subjects (80 men and 20 women) had a mean (SD) age of 27.1 (8.3) years (range 16–52 years) at the time they completed the questionnaire. Both male and female athletes had a mean age of 27 years.

Twenty one subjects reported current symptoms in the right knee and 34 in the left knee. Twenty two experienced bilateral symptoms. Twenty three were pain free at the time of the study.

AGE OF ONSET

The mean age of onset of symptoms was 23.8 (8.6) years (range 16–47 years). Figure 1 shows the age when pain began. Fourteen subjects were unable to recall the exact age of onset of symptoms, and of the remaining 86 subjects, 48 (56%) developed jumper's knee before the age of 20 years. In total, 71% of subjects developed symptoms before the age of 23 years.

PARTICIPATION IN SPORT

Twenty two subjects competed at an elite level (state or national representation), 22 competed at a subelite level (top domestic), and 56 were recreational athletes. Almost half of the subjects (47) played basketball, while a large group (15) played Australian rules football (fig 2). The remaining subjects played a total of 14 other sports (fig 2).

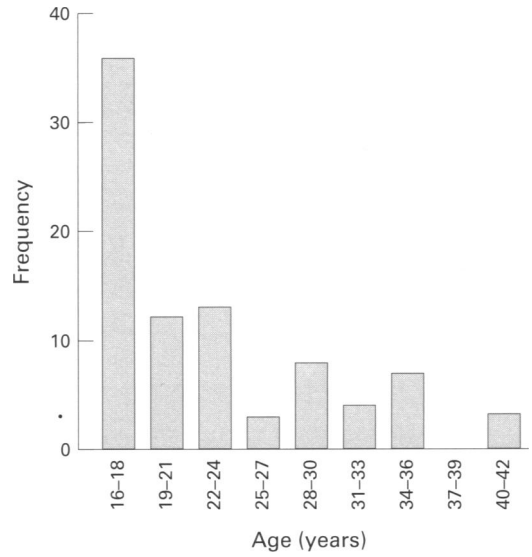

Figure 1 Age of athletes when jumper's knee symptoms began.

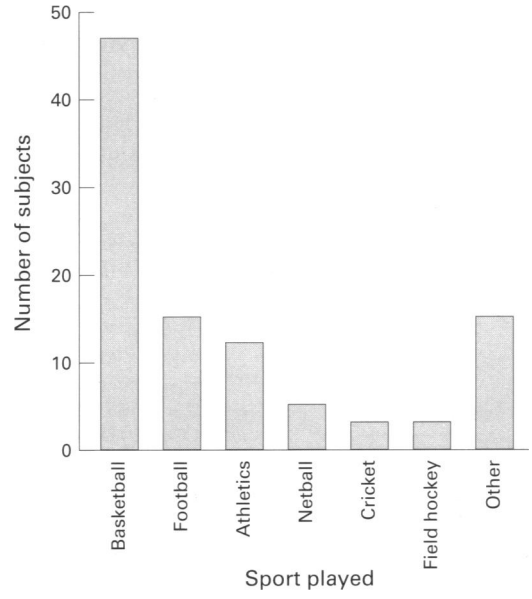

Figure 2 Number of subjects with jumper's knee participating in various sports.

INTERFERENCE WITH SPORT

Three subjects were unable to recall the duration of interference with sport and were thus excluded from this analysis. Of the remaining 97 subjects, 65 (67%) were prevented from playing or training for more than four weeks, or both, by symptoms of jumper's knee (fig 3). Thirty three (34%) subjects were unable to play for more than six months, with 18 (19%) of this group sidelined for more than 12 months.

RECURRENCE

Fifty one subjects entered the study as the result of their first episode of jumper's knee; for 32 subjects it was their second or third episode and for 17 athletes it was at least their fourth episode. Three subjects reported having symptoms for 10 or more years. Thus virtually half of the cases in this study were patients with recurrence of jumper's knee.

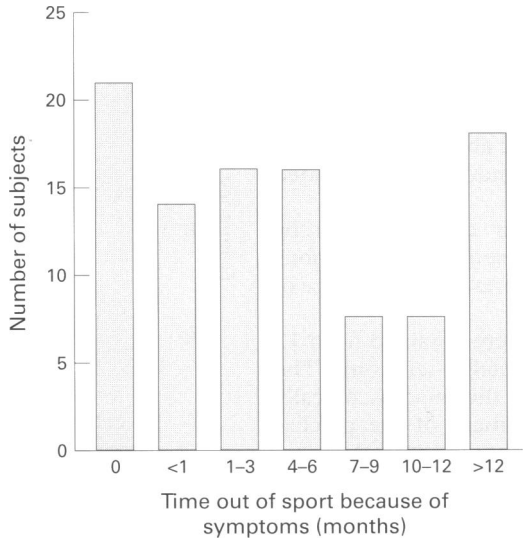

Figure 3 Length of time out of sport because of symptoms of jumper's knee.

SONOGRAPHY

For 57 of the athletes in the study, ultrasonographic examination had been performed. In all cases, a sonographic hypoechoic region was present at the proximal patellar attachment of the symptomatic patellar tendon. This region corresponded to the region of tenderness to palpation.

The mean (SD) hypoechoic region dimensions on transverse plane were width (mediolateral) 11.2 (5.8) mm and height (anteroposterior plane) 8.1 (3.0) mm. In the sagittal (longitudinal, superoinferior) plane the length was 17.8 (6.8) mm (fig 4). In the transverse plane of the tendon, 19 lesions were central, 19 were located medially, and 10 were lateral. The dimensions of the hypoechoic region were not reported for all sonographs.

CONSERVATIVE MANAGEMENT

Sixty one of the patients had physiotherapy, 63 rested, and 50 tried both treatments. As most athletes who tried either of these treatments used both, and as patients were not randomised into treatment groups, we have not compared the relative time to recover from the condition.

SURGICAL MANAGEMENT

Thirty eight subjects had open patellar tenotomy performed by one of two surgeons. These patients had had symptoms for a mean (SD) of 3.8 (3.4) years, and their symptoms had caused them to stop playing sport for a mean (SD) of 7.0 (5.9) months. Both surgeons used the technique of excision of macroscopically abnormal tissue without drilling of the patella.[18] The indication for surgery was pain lasting for more than 12 months.

The recovery time for return to sport after surgery varied from three months to more than a year. Four subjects started sport three to six months after surgery, 18 returned to sport 7–12 months postoperatively, while 10 did not play sport for more than 12 months after their operation. The remaining six subjects had not returned to sport at the time of the study.

HISTOPATHOLOGY

Twelve tendons were examined histologically and in all cases there was relative expansion of the tendinous tissue with loss of the clear demarcation of collagen bundles seen in normal tendons. There was loss of the normal dense homogeneous polarisation pattern. The abnormal tissue showed separation and disruption of collagen fibres on polarisation light microscopy and an increase in mucoid ground substance, confirmed by Alcian blue stain. Maximal mucoid change was present proximally at the insertion site. Inflammatory cells were not seen in any specimen. The findings seen in all cases were constant.

Discussion

AGE OF ONSET

Many of the athletes in our study developed symptoms before the age of 20 years. Thus young athletes participating intensely in high risk sports may be at risk of suffering what has the potential to become a debilitating condition.[10]

SEX DIFFERENCES

The predominance of male subjects in this study may indicate that they are more susceptible to patellar tendon injuries or it may result

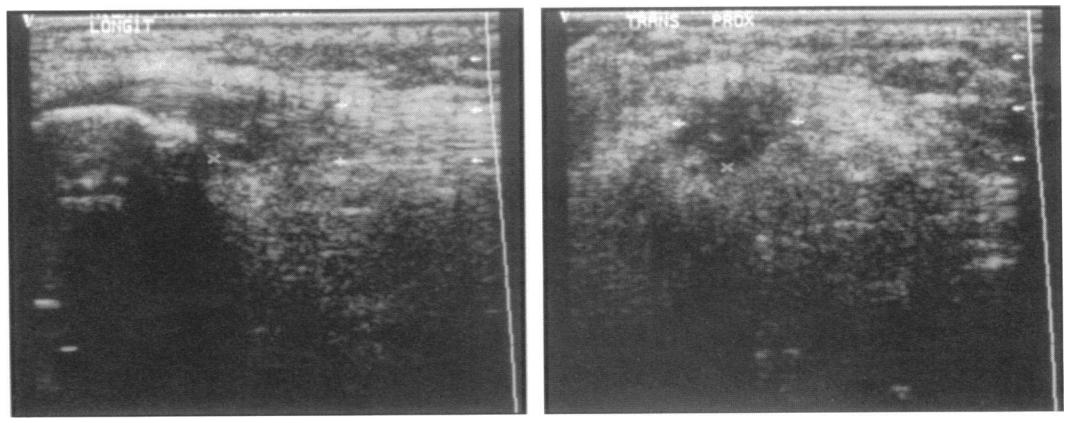

Figure 4 Ultrasonographic image of the patellar tendon of a 31 year old man, demonstrating the characteristic hypoechoic region on sonography at the patellar attachment of the patellar tendon in both the longitudinal or sagittal plane (left) and the axial or transverse plane (right). The portion of tendon corresponding to the hypoechoic region seen on this sonographic scan was excised at open patellar tenotomy, and histopathological excamination showed mucoid degeneration and an increase in ground substance without any inflammatory cells being present.

from sample bias. A prospective study that included all members (thus avoiding ascertainment bias) of a number of randomly selected male and female basketball teams reported that sonographically confirmed patellar tendon abnormality was more common in men than women.[19] It is noteworthy that other studies of patients with jumper's knee also report a predominance of male subjects.[16 20-23] Further research is needed to understand the mechanisms of these differences.

SPORT PARTICIPATION

Our data indicate that jumper's knee is prevalent in basketball and football players. The predominance of basketball players in this study may reflect the type of athletes treated at the clinic from which the population was sampled. Basketball is known to be a high risk sport for jumper's knee.[1 24-26] Incidence rates of overuse injuries of the knee joint, including jumper's knee, in professional basketball players have previously been reported to account for about 15% of all injuries in this population.[27 28]

Previous papers have reported a high incidence of jumper's knee among soccer players.[5 12] We report that Australian rules football players also suffer this condition.

INTERFERENCE WITH SPORT

The fact that 33% of subjects were kept out of sport for over six months because of symptoms of jumper's knee emphasises the importance of early diagnosis.[29 30] However, there are no studies reporting evidence-based treatment protocols for this condition. Our data suggest that reproducible conservative treatment protocols need to be devised and tested for this condition.

IMAGING

Our study design does not permit us to report specificity or sensitivity of sonographic imaging in jumper's knee because patients were excluded from the study if they had sonographic abnormalities at the mid or distal patellar tendon. We found that there was a typical appearance of the proximal patellar tendon in jumper's knee and this is consistent with work of others.[31-33]

Recently, magnetic resonance imaging (MRI) has been used by researchers to characterise the features of jumper's knee.[34-41] It has been reported that the location of the hypoechoic signal on sonography corresponds to regions of abnormal signal on MRI.[23 42] McLoughlin *et al*[38] concluded that "the precise role of MR imaging in patellar tendinitis necessitates further study".

RESULTS OF SURGERY

Our data indicate that the median time to return to sport after open patellar tendon surgery was 7–12 months. A recent prospective study of the outcome of open patellar tendon surgery suggested that at least nine months were required.[43] Several authors have recommended that athletes can return to sport between three and six months after surgery,[11 12 21 44] but premature return to jumping sports after surgery may contribute to poor outcome.[6 11]

SUMMARY

Our study of athletes presenting to a sports medicine clinic showed that jumper's knee can cause long term symptoms. Young athletes were affected. Jumper's knee may affect men more frequently than women but the reason for this is not understood. Many patients suffered recurrence of symptoms. Over one third of the patients eventually required surgery. After surgery, 7–12 months rehabilitation was generally required before return to sport. Histopathological examination of tendon lesions showed tendon degeneration or microtears, or both, rather than inflammatory cells. We conclude that the natural history of jumper's knee in sports people is not that of a self limiting benign condition. We consider the course of jumper's knee is consistent with the reported pathology of tendon damage (tendinosis rather than tendinitis).[4 14 18 23 27 45 46]

FUTURE NEEDS

Longitudinal studies of young athletes of both sexes would permit us to determine at what age jumper's knee commences and under what circumstances. This may benefit our understanding of the pathophysiology of this condition. In addition, there is a great need for effective conservative treatment protocols with measurable end points that are testable using evidence-based medical principles. Given the lengthy rehabilitation period required after open patellar tenotomy, and the fact that results are not uniformly predictable, there may be a benefit in comparing the effectiveness of arthroscopic patellar tendon surgery with the traditional open tenotomy.

Investigators in the Victorian Institute of Sport Tendon Study Group are: I Anderson, J Bartlett, S Bell, F Bonar, D Bracy, C Bradshaw, F Burke, B Caldwell, J Cook, K Crichton, R Dalziel, P Desmond, R Dowling, P Ebeling, S Evans, M Fehrmann, P Fuller, A Garnham, M Grant, P Harcourt, W Hare, I Henderson, C Kearney, D Kellaway, K Khan, Z S Kiss, P Larkins, P O'Brien, R O'Sullivan, C Morris, C Purdam, R Quirk, J Read, R Shnier, B Tress, P Visentini, J Wark, P Wilson, D Young. The following institutions are represented: Department of Medicine, University of Melbourne, Royal Melbourne Hospital; Department of Radiology, University of Melbourne, Royal Melbourne Hospital; Australian Institute of Sport; Victorian Institute of Sport.

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