RACQUET SPORTS — PATTERNS OF INJURY PRESENTING TO A SPORTS INJURY CLINIC

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ABSTRACT

In an 8-year retrospective study, 631 injuries due to the racquet sports of squash (59%), tennis (21%) and badminton (20%) were seen in a sports injury clinic, males predominating (58 to 66%). The proportion of squash injuries was higher than expected and probably relates to higher physical stress and risk of contact in this sport. Also they occurred mainly in persons over 25 years (59%) i.e. the reverse for sport in general. Acute traumatic injuries were seen especially in squash players, a majority affecting the knee, lumbar region, muscles and ankle. Tennis injuries differed most with lateral epicondylitis, patello-femoral pain and lumbar disc prolapse being relatively common. The badminton injury pattern overlapped the others. Lower limb injuries predominated in all three. Detailed assessment of 106 cases showed many to be new, infrequent, social players. Poor warm-up was a common factor in new and established players. The importance of these findings is discussed.

Key words: Sports injury, Racquet sports, Squash, Badminton, Tennis.

INTRODUCTION

The purpose of this study was to investigate and compare the pattern of injuries presenting to a sports injury clinic in players of the racquet sports squash, badminton and tennis.

Robey et al (1971) discussed the need for epidemiological reviews to document the nature of the injuries that occur when participating in particular sports. Previous reports of injuries seen individually in squash (Berson et al, 1978; 1981), badminton (Mills, 1977; Hensley and Paup, 1979) and tennis (Kulund, 1979) have been either anecdotal or based on questionnaires. While anecdotal reporting indicates the range of possible injuries it does not give information on their relative frequencies. The use of questionnaires can result in under-reporting of moderate injuries when a survey is carried out retrospectively and over-reporting of trivial injuries if carried out prospectively. Also the true diagnosis may be in doubt from player-reported injury. In addition the available information on squash injuries comes from the American literature (Berson et al, 1978, 1981) where the game played has differences from that played elsewhere. We therefore felt it worthwhile studying the injuries that occur in racquet sports and present to a sports injury clinic where an accurate diagnosis may be made.

Although the three types of game share obvious similarities, different types of courts, relative weight of racquet and ball/shuttle, and playing techniques, plus the particular risk of physical contact in squash, might be expected to produce differences in the injuries sustained. A previous report from this clinic by Devereaux and Lachmann (1983) of all injuries presenting over a two-year period did show a relative preponderance of squash injuries compared to badminton and tennis over that time period and an apparent difference in the incidence of certain injuries.

PATIENTS AND METHODS

Athletes present to the Sports Injury Clinic at Addenbrooke's Hospital, Cambridge, run on weekday mornings. They do so on a self-referral basis for acute injuries (usually within 48

hours). Chronic injuries are seen at the request of a general practitioner. Each patient is seen and assessed by a rheumatologist with the aid of full hospital investigative services. Lacerations, fractures, eye and head injuries are treated acutely by the Accident Service and not usually seen in the clinic.

The records for patients attending the clinic with an injury related to a racquet sport during the preceding seven years were analysed. In each case the sport, age, sex and diagnosis were recorded. Details of patients presenting over a further year were documented noting duration of injury, relevant past history, standard of game played, playing frequency, time of onset of injury during a game and onset in relation to starting the sport. The treatment given was also recorded.

In all cases, only the presenting injury was recorded. The few patients who presented with a further injury were included separately in the analysis. Where relevant, significant differences were confirmed statistically using the Chi Squared test.

RESULTS

During the 8-year period studied there was a total of 631 injuries related to participation in racquet sports. This constituted around 12% of the total injuries seen. Three hundred and seventy-two were related to squash (59%), 131 to tennis (21%) and 128 to badminton (20%). The male:female ratios were squash 2:1, tennis 1.47:1 and badminton 1.37:1 (Table I). This compares with estimated figures from the Squash Rackets Association Survey (1985) for participation within the population of England and Wales which show similar numbers involved in each sport (badminton 3.5 million, tennis 3.2 million and squash 3.1 million). Therefore squash players would appear to be almost three times as likely to present with an injury than those in the other two sports. However, since there is no available data on frequency of play it is not possible to calculate an accurate comparative risk. More male players were seen, particularly in squash (Table I).

TABLE I
Sex Distribution

	Squash	Tennis	Badminton
Male	248	78	74
Female	124	53	54

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TABLE II
Age Distribution

	Squash	Tennis	Badminton
15 and under	3	13	4
16-25	150	60	60
26 and over	219	58	64

TABLE III
Site of Injury

	Squash	Tennis	Badminton
Upper limbs	80 (22%)	45 (35%)	32 (25%)
Lower limbs	215 (58%)	59 (45%)	76 (59%)
Trunk	77 (20%)	27 (20%)	20 (16%)

Squash

Players aged 26 and over predominated (59%) as indicated in Table II. Annual attendances in these older adults doubled during the period studied. In this sport 58% of injuries affected the lower limb (Table III). Injuries in squash players most frequently affected the knee, lumbar region, ankle (mainly ankle sprains) and muscles, especially the calf (Fig. 1). Injuries to the elbow region (mainly tennis elbow, 4%), shoulder and foot were relatively less often seen than in the other sports. Eighty per cent of injuries were of acute traumatic type rather than due to overuse.

Fig. 1: Regional distribution of racquet sports injuries.

Muscle injuries were not more commonly seen in older players but no assessment of severity could be made. Females with rotator cuff tendinitis were younger (mean 25 years) than the males (35 years). The reverse was true for meniscal injuries in the knee.

Tennis

There were fewer injured tennis players seen and they had a different pattern of injury. Although lower limb injuries predominated (45%), upper limb injuries (35%) were

relatively more common than in the other sports (Table III). Injury to the knee occurred commonly (Fig. 1) but was usually less severe than in badminton and squash; patella-related problems were most frequent (vide infra). Lateral epicondylitis was a common injury (10.7%). Forty-three per cent of injuries to the lumbar region were clinically due to disc prolapse. Overuse injuries (30% of the total) such as tendinitis were more common than in squash (20%). Ankle sprains (5.3%) were rarer than in squash (12.4%) and badminton (10.2%). Muscle injury did not occur as commonly and mainly affected the hamstrings. A sexual predominance was seen for several injuries (Table IV) and female tennis players with patello-femoral pain were on average 9 years younger (mean 19 years) than males.

TABLE IV
Sexual Predominance of Injury

	Male > Female	Female > Male
Squash	Knee (traumatic synovitis) Acromioclavicular joint strain	Calf muscle Rotator cuff
Tennis	Calf muscle Knee (collateral ligament) Lumbar strain	
Badminton	Knee (total)	Calf muscle

(All significant at $p < 0.05$ or less)

Badminton

This racquet sport had an injury pattern that overlapped with the other two sports (Fig. 1) in that the frequency of lower limb injuries (59%) involving the knee and ankle and also muscle injuries was similar to squash but the frequency of lateral epicondylitis (9.4%), shoulder and foot injuries was similar to tennis. Badminton produced fewer lumbar disorders but more neck injuries than the other sports.

TABLE V
Knee Injuries

	Per cent of Total		
	Squash	Tennis	Badminton
Collateral ligament	33	12	28
Patello-Femoral	23	44	22
Patella dislocation	4.5	16	0
Meniscal	17	12	25
Cruciate	6.8	0	12.5
Traumatic Synovitis	9	4	6.3
Other	6.7	12	6.2

Knee Injuries

Although the knee was commonly affected in all 3 racquet sports the type of injury differed (Table V). Collateral ligament, cruciate ligament and meniscal injury more often occurred in badminton (65.5%) and squash (56.8%) than tennis (24%). By comparison patello-femoral pain and patella dislocation were more common in tennis players (60%). Other injuries included non-specific knee sprains, patella tendinitis, symptomatic osteoarthritis and Osgood Schlatter's disease but the numbers seen were small.

Lumbar Injuries

The lumbar region was a frequent site of injury in these racquet sports players. Tennis players were particularly likely to have a disc prolapse (43%) compared to squash (35%) or badminton (25%) where less severe lumbar strains predominated.

Detailed Assessment Study

Up to a third of patients studied in detail (106 injuries) had taken up a racquet sport recently (< 3 months). Most had only started a few weeks previously and some injured themselves in the first match. An increase in playing frequency was a factor in a few of the regular players. While 25% of squash and badminton injuries occurred in those who played infrequently (< once per week) this was only the case in 10% of tennis players.

In up to 20% of players, injury occurred within a few minutes of starting play. A similar percentage continued playing in spite of the injury. Twenty per cent or more had a past history of an injury to the affected area and over 30% admitted to milder symptoms prior to frank injury. Although not a large group, it was noted that 4 out of 5 cases of patello-femoral pain in tennis occurred in adolescents who were rapidly growing.

The standard of game resulting in injury varied between sports. Whereas over 30% of tennis and badminton players played only socially this was the case in under 20% of squash players. Fifty per cent of players sustaining a squash injury did so while playing at club or college level, this figure was similar for badminton (46%) but only 23% of tennis players played at this level, 46% playing at a high level representing Cambridge University or County.

DISCUSSION

Racquet sports have a wide appeal to a large age range in the population (8 to 66 years in this study). This is confirmed by the number of older players, over the age of 25 years, seen and is in keeping with other reviews of squash (Berson et al, 1978, 1981), albeit referring to the American form, and badminton (Hensley and Paup, 1979) injuries. The older average age is in contrast to that of sports as a whole (Newman et al, 1969; Sperryn 1972; Grisogono, 1981; Devereaux and Lachmann, 1983) where injury is seen in younger athletes, reflecting the overall younger age of those engaged in active sports. In addition females were more commonly seen than in these studies probably due to their particular interest in racquet sports.

The relative preponderance of squash injuries seen would fit with higher levels of stress being involved and the risk of physical contact. A high level of physical stress can be less tolerated by body tissues as they age. This would explain the predominance of older players seen. The overall higher numbers seen are also likely to be partly due to a lack of a true playing season. More players may be aged 26 or over although there are no statistics available for confirmation. The relative risk of injury in squash is likely to be even higher than observed, for eye injuries and lacerations are not uncommon but are not seen in the sports injury clinic.

The patterns of injuries in the 3 racquet sports show similarities and differences. Squash players tend to be older and suffer more acute traumatic injuries (80%) compared with the other two (70%) where overuse-type injuries were more often seen. This difference agrees with previous findings (Devereaux and Lachmann, 1983) but there was no

clear separation in terms of the actual injuries sustained.

The higher physical stress involved in the male game would account for the predominance of certain injuries but why calf muscle strains are a feature in female squash and badminton players is not obvious.

The injury patterns for squash and tennis differed the most with the pattern for badminton being close to that of squash for some injuries and to that of tennis for others. Achilles tendon injuries were not more frequent in squash but assessment of the actual severity of the injuries could not be made on the available information.

Squash and tennis did have a similar frequency of injuries to the lumbar region but disc prolapse was more common in the latter. This higher proportion of disc prolapse in tennis players may be due, at least in part, to the particular serving techniques in that game.

Injuries to the knee, the ankle and to muscles were similar in frequency and type for squash and badminton. Although knee injuries were quite frequent in injured tennis players they were usually less severe. The differences may relate to playing with knees flexed and sudden changes in direction plus twisting movements required on the smaller courts of squash and badminton. The predominance of patello-femoral pain in tennis may reflect harder court surfaces.

Injuries around the elbow, shoulder and in the foot had a similar frequency in the tennis and badminton players. Those around the elbow were mainly due to lateral epicondylitis. The percentage of total badminton injuries due to this condition is similar to that reported by Hensley and Paup (1979) and Carroll (1981) found it to be common among the tennis players he surveyed. Berson et al (1981) reported that not only were injuries in female squash players much rarer but occurred at a younger age than males. Apart from rotator cuff injuries this was not the findings of this study. Those with meniscal damage in the knee were in fact older.

The majority of injuries occurred in regular players who played competitively. However, injury was often unrelated to the stresses of frequent play or competition. More than 25% of the players assessed prospectively had developed an injury within a fairly short time of starting a racquet sport. Others usually played infrequently and only socially. The injuries seen in this study were not insignificant as the majority required physiotherapy and some of those with more severe injury, especially in the knee, needed referral to the orthopaedic department. The way the Sports Injury Clinic has been run at this hospital has meant that not all injuries that occurred as a consequence of racquet sports were seen but the review of cases has provided information on the majority of injuries likely to have presented for medical attention and has shown both their type and relative frequency.

The detailed assessment study indicated that injury was often seen in those players who had only recently started to play a racquet sport and/or played infrequently usually at a low 'social' competitive level. This shows a particular need to improve the education of those starting the sports to try to reduce the risk of injury. Injuries occurring within a few minutes of starting play suggest that warm-up exercises are not being carried out properly, if at all, by some players.

Continuing to play once injury occurs and not heeding physical warning of impending injury needs to be

discouraged. It is possible that at least some of the not inconsiderable number of patients with a past history of injury to an area may have avoided further problems with care and attention to fitness of that part of the body.

All these findings reinforce the continuing need for improved education of people undertaking sport to try to reduce the number of injuries that may result, to limit their severity and reduce recurrences. This is especially so for racquet sports which have such a wide appeal to a large age range in the general population.

A preliminary report of this work was presented at BASM's Congress 86 in Southampton.

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BOOK REVIEW

Title: CONTEMPORARY PERSPECTIVES IN REHABILITATION. VOLUME ONE — THERMAL AGENTS IN REHABILITATION

Editors: Susan L. Michlovitch, MS, PT and Steven L. Wolf, PhD, PT

Publisher: F. A. Davis and Company, Philadelphia UK Agent: Quest Meridien, Beckenham

Price: \$US 29.70 Hard back ISBN 0 8036 6164 9

This is an excellent book that was compiled by Susan Michlovitch because of her concerns about the way the topics of "Thermal Agents were taught and the counter productive effect such instruction might have on clinical decision making". The book is aimed principally at the physiotherapist, it not only gives a great deal of basic information on thermal agents but encourages the clinician to think again about the use of thermal agents, whilst the researcher is given information that provides ideas for clinical studies.

The book is divided into three parts:

Part One — The Foundations for the use of Thermal Agents — which includes a great deal of discussion on the proposed mechanisms by which heat and cold can alter inflammation, healing and pain.

Part Two — is about the electromedical equipment. Physiotherapists have become responsible for advising on buying certain electromedical equipment and here we have chapters incorporating the concept of equipment, selection, operation and maintenance and a thorough description of clinical application.

Chapter three stated that the effective and safe use of electromedical equipment requires a thorough familiarity with each piece of equipment and understanding of electrical principles. Part of this chapter is specifically for the US therapist; the power supply to North America alternates at a regulated frequency of 60 Hz and the line of voltage varies between 110-125 volts, whereas electromedical equipment in the UK and most of Europe works at a frequency of 50 Hz and a voltage output of 220-240 volts. The need for a close working relationship with the electrical engineer, or the company manufacturer's engineers to help in the evaluation, regular inspection and preventive maintenance of equipment is impressed upon the reader.

The next four chapters discuss the operation and application of heat and cold agents, cryotherapy, hot packs, hydrotherapy, therapeutic ultrasound, shortwave and microwave diathermy. These chapters enumerate the physical principles, biophysical effects, clinical applications and general guidelines, contra-indications and completing each chapter with a summary and comprehensive list of references. The most important principle expanded, that before any treatment is given all patients must be evaluated and treatment goals established and contradictions to treatment must be known, as well as the safe and effective use of the equipment must be understood.

There is a chapter on low power laser and although this isn't truly within the theme of thermal agents, because laser is not expected to produce an increase in tissue temperature so its effects could not be attributed to thermal mechanism, but is considered well worthy of inclusion in the book.

Part Three — Clinical decision making helps both the student and the clinician to consider the basic concepts that are being presented in this book and emphasises problem solving and evaluation.

Chapters eleven and twelve expand on the application of cold and heat in the treatment of specific conditions and deals with the treatment of athletic injuries and rheumatic conditions.

There are two appendices, temperature conversion tables, because this publication uses centigrade scale and a list of some of the manufacturers of electromedical equipment products in the United States, which is not particularly of value to our British therapists and students.

I wholeheartedly recommend this book to physiotherapy teachers, students and clinicians. Here is a book that, in a clear easily readable form has put together long needed information about the use of thermal agents in rehabilitation.

Margaret John