The Nature and Frequency of Rugby Injuries

A PILOT STUDY OF 300 INJURIES AT STELLENBOSCH

S. P. ROY

SUMMARY

A survey of rugby-football injuries was conducted during the 1973 season, and 300 injuries were subjected to statistical analysis. Many injuries were found to be unnecessary. Since they were often due to foul play, it is felt that the injury rate could be reduced by improved control of the game. The incidence of knee and ankle injuries could be reduced by improving the design of the boots. The case for the 'sports generalist' is put forward, and his role in the prevention and treatment of injuries is outlined.

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Few will deny that rugby is a dangerous sport. The widespread participation in the game in South Africa must mean that there are many thousands of rugby casualties every year. Yet there have been few attempts to organise medical services that are sport-orientated (with the recent exception of the University of Stellenbosch), nor have there been well-organised statistical surveys on the incidence of rugby injuries in this country.

Although we have no definite idea how many injuries occur, the figures for American football, where admittedly much protective equipment is worn, may give us some indication. In a recent survey[1] it was estimated that there is an injury rate of 0,541, which means that with 1,2 million high school players in America, there are 649 200 injuries per year.

It is hoped that this pilot study may bring about a realisation that rugby injuries are a neglected field, needing our earnest and immediate attention. It is felt that the current incidence of injury is too high, and should be reduced. This can only happen when sport medicine is recognised and formally organised, and when the team doctor is given the necessary authority to act according to his knowledge and principles.

The basic aims of this survey were threefold:

(i) to determine the pattern of injury and associated factors;

(ii) to establish what role, if any, factors such as late tackles, foul play and equipment play in the aetiology of injuries;

(iii) to analyse those aspects of rugby which are *unnecessarily* dangerous, and to suggest ways of decreasing the risk involved without materially affecting the game.

Stellenbosch, CP
S. P. ROY, M.B. CH.B., *General Practitioner*

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PATIENTS AND METHODS

The material for this survey came from patients seen in a one-man general practice in a university town. It does not cover the total number of injuries occurring at Stellenbosch, nor is it controlled. The patients were seen on a random basis and were completely unselected. Only patients who completed the survey form were included. The survey extended from February to October 1973.

Most of the patients were students from Stellenbosch University, although some scholars are also included. Stellenbosch University has a large rugby-playing community (±58 teams and 1 000 players). In this survey these teams were divided into two groups:

(a) *senior teams* (viz. the first team and Victorians who both played in the first league, the second team, who played in the second league, and the top three under-20 teams);

(b) *koshuis* (men's residence or 'house') teams. There were 5 *koshuis* leagues, each consisting of 8 - 14 teams. Players are not permitted to play senior and *koshuis* league matches during the same week.

The majority of the school players in this series came from the 'Craven Week' matches (interprovincial school rugby) which were played in Stellenbosch in July 1973. A few club players from other senior clubs were also included. All the players included in this survey were treated as private patients, and were seen either in the consulting rooms or at the local hospital. Injuries seen only on the field were not considered.

Data were collected by means of a form filled in by the player in the waiting-room before being examined. Hospital cases filled in the form at a convenient time during recovery. The form used was a modified version of that issued by the Medical Committee of the South African Rugby Board and provided information on age, occupation, team, height, weight, position, date of injury, part of body injured, whether a regular player, any recent lay-off, whether he had warmed up, the type of game played, the field and weather conditions, the time of injury in relation to the practice session or match, the make and type of boot, the type of studs, and previous injuries sustained.

The information from the 300 responses was computerised and then subjected to statistical evaluation.

Definitions

For the purpose of this study an injury is regarded as such if it resulted in the player requesting private medical treatment.

A sprain is defined as an injury to a ligament, while a strain relates to a musculotendinous injury. These injuries are graded as 1st, 2nd or 3rd degree, depending on severity—1st degree is a minor tear with no loss of strength; 2nd degree is a definite tear with loss of strength, but no abnormal motion; 3rd degree means a complete rupture.[2]

RESULTS

As shown in Table I, the head, face, knee and ankle were by far the most common sites injured, accounting together for 48,5% of the total number of injuries.

TABLE I. INJURY FREQUENCY BY ANATOMICAL SITE

Site	%
Head and face	20,5
Knee	14,5
Ankle	13,5
Acromioclavicular joint	6,5
Shoulder muscles	3,5
Ribs and lungs	3,5
Quadriceps contusion	2,5
Others	35,5

Head and face injuries consisted mainly of cuts (60%), facial fractures (13%), and ear haematomas (9%). Of those with head and face injuries, 10% were either unconscious or suffering from concussion.

Of the 43 knee injuries, the 15 who underwent operation included: O'Donoghue's triad (2), anterior cruciate + medial ligament (1), medial ligaments alone (2), anterior cruciate ligaments alone (2), medial ligament + medial meniscus (1), medial menisci (2), posterior cruciate + medial ligaments + medial meniscus (1), lateral ligament + biceps muscle + lateral meniscus (1), lateral ligament + lateral meniscus (1), lateral ligament alone (1), and acute subluxation of the patella (1).[3]

Of 40 ankle injuries, 6 underwent operation—lateral + inferior tibiofibular ligament + fractured medial malleolus (1), lateral + inferior tibiofibular ligament (1), lateral ligaments alone (2), inferior tibiofibular ligament alone (1), torn posterior tibial muscle sheath with slipping of the tendon over the medial malleolus (1).

There were three 3rd-degree acromioclavicular dislocations which were secured by means of a transverse screw.

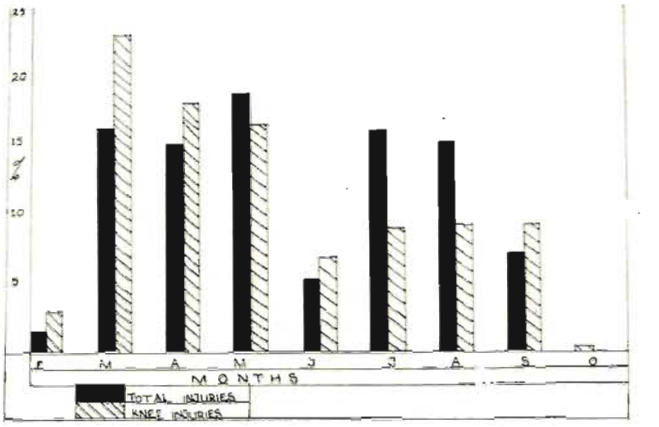

Fig. 1. Frequency of total injuries per month compared with knee injuries.

From Fig. 1 it can be seen that the rate of injury was more or less constant throughout the season, the drop in June being due to the University vacation (mid-June to mid-July). The number of injuries in both halves of the season were approximately equal. The July figures were augmented by the 'Craven Week' injuries.

It is also evident that 70% of knee injuries occurred in the first half of the season, 23% in March alone.

TABLE II. TIME OF INJURY DURING MATCH OR PRACTICE SESSION

	%
1st quarter	24,5
2nd quarter	23,0
3rd quarter	29,5
4th quarter	23,0

A breakdown of the match or practice session into quarters showed that the injury rate was fairly constant throughout (Table II), though slightly more injuries occurred during the third quarter (i.e. directly after half-time) than during the other quarters. These findings are very similar to those of Bramwell *et al.*[4] Ninety per cent of the players injured claimed to be fit and regular participants, while 3% stated that they played occasionally, and 7% had just started after a lay-off. As regards 'warming up', 94% said that they had warmed-up well before playing, 3% only partially, and 3% not at all.

TABLE III. PATTERN OF INJURY IN VARIOUS TEAMS

Teams	Total % of injuries	Ankle %	Knee %	Face and head %
Koshuis	56,5	60	56	70
Senior	21	12,5	18	24
Under-20	9	10	11	
Schools	8	10	4,5	0,5
Other senior club teams	5,5	7,5	10,5	5,5

From Table III it can be seen that *koshuis* players (in practice and matches) had a high incidence of head and face injuries, while relatively few ankle injuries occurred in senior team players. The schools produced a low rate of face and knee injuries (possibly owing to these matches being played mainly on wet fields).

TABLE IV. PERCENTAGE OF INJURIES IN VARIOUS EVENTS

Event	Total	Face and head
Koshuis matches	33,0	49,0
Practice (all teams)	34,5	25,5
Club matches (senior teams) ...	23,5	20,0
Schools	9,0	5,5

It is evident from Table IV that facial injuries were very prevalent in *koshuis* matches. *Koshuis* practices also produced a higher incidence of injuries compared with practice sessions of senior teams (43% as against 33%).

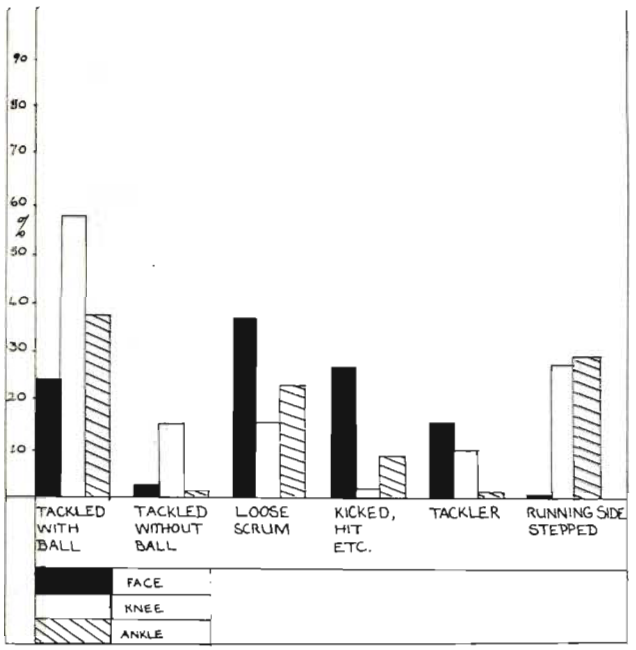

Fig 2. Mechanism of injury as it affects various sites.

The various mechanisms that produced face, knee and ankle injuries are shown in Fig. 2.

If the categories 'tackled without the ball', 'loose-scrum', and 'foul play' are grouped together, they account for 34% of all injuries, 35% of ankle injuries, and 29% of knee injuries. Of face injuries, 61% occurred without the player being in possession of the ball, while 48% of this 61% were described as being due to blatant foul play. Two-thirds (65,5%) of the face injuries occurred among the forwards.

The most frequently worn boots were Olympic (31%) and Adidas (29%). It was observed, however, that 46% of players who suffered ankle injuries wore Olympic boots, as opposed to only 23% of ankle injuries occurring in players wearing Adidas boots. Cutaway boots were worn by 70% of players, but were incriminated in 83% of ankle injuries, with only 17% occurring in players wearing high-cut boots.

The results of short *v.* long studs proved inconclusive.

Analysis of the height and weight of players showed that 43,5% of ankle injuries occurred in those 1.84 m to 1,92 m (6′ to 6′ 3″) tall, with a weight of 80 to 90 kg (175 to 200 lbs).

TABLE V. INJURY FREQUENCY BY POSITION

Position	Adjusted %
Fullback	9,5
Wing	10,5
Centre	9
Flyhalf	8,5
Scrumhalf	7
Prop	9
Hooker	11
Lock	11
Flank	11
8th man	14

The variation in the injury frequency between the different playing positions is shown in Table V. These figures have been adjusted, i.e. the numbers for the positions with only one player (e.g. fullback) were doubled, and the percentages based on the adjusted number.

An analysis of the injury rate of the various positions under different weather conditions (e.g. is a scrumhalf more often injured in wet weather?) did not show any significant difference from the basic injury rate for those positions. Thirty-five per cent of injuries occurred in wet weather, but only 13% of knee injuries occurred under these conditions (as opposed to 33% of ankle injuries).

Serious injuries (excluding long-bone and joint injuries) included splenic rupture (1); prolonged concussion with no clinically detectable after-effects (2); concussion on a number of occasions resulting in clinically-detectable after-effects (1); temporary brachial plexus palsy (1); and hyper-flexion of the thoracic spine, resulting in a compression fracture of the 8th thoracic vertebra (no neurological effects) (1).

DISCUSSION

The injuries observed in this survey were remarkably similar in type and number to those obtained in a study by Allen[5] of 290 football injuries seen in the USA Air Force, the outstanding differences being the complete absence of acromioclavicular separations and the low incidence of face injuries in his series. These will be discussed under appropriate headings.

It is common knowledge that impressions can be misleading, and while it is often stated that more injuries occur at the beginning of the season when players are

unfit and at the end of the season when they are stale, than at other times, the survey did not confirm this. The total number of injuries in any one month appeared to be related more to the amount of rugby played in that month than to any other single factor. (This, of course, does not necessarily apply to individual injuries, for example, knee injuries were much more common in the first three months of the season).

Again, rugby tradition has it that most injuries occur at the beginning of the match when the players are 'cold', or at the end when the players are tired—the study showed that most injuries actually occurred just after half-time, although the distribution throughout the time played was fairly even.

Knee Injuries

Knee injuries were the most common disabling injury, and it is felt that no effort should be spared in devising means to prevent their occurrence. Of the knee injuries in this survey, 35% were operated upon, most of them for definite 3rd-degree ligament tears. This high rate is probably partly due to the fact that most of the injuries seen were serious, in that those with 1st-degree injuries did not bother to come for advice.

Much research has been done in America on the mechanisms of knee injuries in American football. The same principles apply to rugby-football. The injury usually occurs when a force is applied to the proximity of the knee while the foot is firmly held by the studs being fixed in the turf. Rotation and/or release of the studs protects the knee against ligament and meniscus injury. This concept has led to the introduction of the rotational base boot (swivel boot) into American football.[6]

Fig. 3. The swivel boot devised by Camerow and Davis.

Many factors which supported the 'fixed-foot' hypothesis became evident in this survey. For instance, 57% of knee injuries occurred during March, April and May alone—the grass at Coetzenburg (where most of the players played) was particularly thick and tough during this time, with a very firm root system. It is thought that studs become firmly locked in this type of surface, and once the grass becomes softened by winter rain, the studs do not tend to lock so firmly, and the knee injury rate drops. To emphasise this point, only 4% of knee injuries occurred in wet weather, as opposed to 33% of total injuries.

A study was recently performed to evaluate the effect of multiple studs on knee injuries,[7] and it was shown that boots with 14 studs had a lower knee injury rate than conventional boots—the authors therefore recommended that ideally boots should have:

(i) a synthetic moulded sole;
(ii) a minimum of 14 studs per boot;
(iii) a minimum stud tip diameter of $\frac{1}{2}$ inch;
(iv) maximum stud length of $\frac{3}{8}$ inch.

Interchangeable studs, now standard on many makes of boots in South Africa, could be used to advantage if the long studs were used only on wet days, so decreasing the chance of the foot becoming firmly locked on a dry field with thick grass.

The theoretical advantages of the rotational base boot make it tempting to suggest that it replaces the conventional boot (except, perhaps, for the first- and second-row forwards), but so far the boot has not been subjected to a large-scale trial in South Africa. It is hoped that such a trial can be organised. These boots will not, of course, protect the knee against injury in a loose-scrum, where a player falls across the outstretched leg of another.

Seventeen per cent of knee injuries occurred as a result of early or late tackles, one of the most common failings in our rugby. Too often one hears the comment that the tackle was unavoidable since the tackler was already committed when his opponent parted with the ball—if a player with the ball can dodge his opponent, then there is no reason why a tackler cannot pull out of a tackle. It is more a matter of approach and education, and here the referees and coaches, especially school coaches, can do much to develop the right attitude in their pupils. If a player is guilty of 2 late tackles in one match, he should be sent off the field.

A further preventative measure could be to change the method of tackling. There is no need for a player to be tackled at, or just above or below, his knee-joint. Dr Danie Craven has often suggested that the opponent be tackled at waist level with one arm around the ball, which not only makes sense from the tactical point of view, but will also help cut down on the number of acromioclavicular joint injuries in the tackler, and knee injuries in the player tackled.

Ankle Injuries

The ankle is the other joint where the frequency of injury is largely influenced by the boot design. Here, 83% of injuries occurred in players wearing low-cut boots, and only 17% in those wearing high-cut boots. It was also interesting to see that the frequency of ankle injuries differed for different makes of boots. This might well be due to a combination of factors, such as: (*i*) the point where the boot flexes; (*ii*) the amount of flexion permitted by the sole of the boot; and (*iii*) the greater susceptibility of the foot to slip partially out of the boot when the

design does not offer adequate support, as when the laces cannot be tied behind the ankle.

Little scientific work has been done so far in this country to establish the medical requirements for rugby boots, although the Medical Committee of the South African Rugby Board has drawn up a list of recommendations regarding the design of boots.

It is also evident that lack of athletic skill plays a part in the frequency of ankle injuries, and this is, to some extent, reflected in the survey by the lower rate of ankle injuries in senior teams, and the increased incidence in the heavier and taller players.

Strapping of ankles is usually avoided in South Africa, yet many American football trainers and orthopaedic surgeons associated with well-known teams, advocate routine strapping of ankles for all practice-sessions and matches.[8,9] While strapping will not prevent a serious injury from taking place if a strong enough force is applied, it might well prevent the less serious but annoying ankle injury from occurring. Players with ankle ligament weakness should certainly strap as a routine.

In spite of opposition to routine strapping,[10] there is no conclusive evidence that routine strapping in any way weakens the ankle joint, nor the ligaments or muscles surrounding it. A valid argument against prophylactic strapping, though, is that it may transfer the torsional force to the knee, and that it is preferable to deal with an ankle than a knee injury.[11] However, Slocum[9] states that this does not occur to a dangerous degree in the well-trained player, and that properly-applied strapping can reduce the incidence of sprain by 90%.

Another cause of ankle injuries is unevenness of the field of play. Those responsible for field maintenance should be alerted to the unnecessary dangers caused by an uneven playing surface.

There has been some talk lately that artificial turf such as 'Astro-turf' may be introduced. It has not been shown that this surface is safer than well-kept grass (although easier to maintain); in fact, a pilot study[4] suggested that it might well *increase* the rate of injury, as well as changing the type of injury sustained.

Face and Head Injuries

The majority of face and head injuries could probably be classed as unnecessary rugby injuries. In this survey, 70% of facial injuries occurred in *koshuis* players and nearly half the total number of facial injuries occurred in *koshuis* matches, as opposed to 19% in club matches. These figures highlight the tendency of *koshuis* matches to be extremely emotional affairs, where a lack of rugby skill is often made up for by excessive enthusiasm and determination. Over-robust play often leads to 'boot work' in loose scrums with the resultant high rate of facial injuries (Fig. 2).

Even though concussion can have serious consequences, it appears to be ignored by many in South African rugby. Thorndike at Harvard states:[8] 'When there has been loss of consciousness on three occasions, our code automatically prevents him (the football player) from entering competition, and necessitates a detailed examination and consultation with the neurosurgical consultant'.

There is at present no set rule as to who is responsible for ordering the removal of an injured player from the field. This cannot be better illustrated than in the case of the concussed player. We all know of instances where a player finished the game, even though he had no idea where he was or what he was doing. The Rugby Board could help here by laying down a definite code stating who must take the responsibility for making decisions of this sort. Permitting a player with concussion to continue playing should not be tolerated.

While the helmet worn in American football does not eliminate concussion, it appears to decrease the severity when it does occur. In Allen's series[5] there were 8 cases of concussion, but only one of these was of 2nd-degree severity (as defined by the American Medical Association's Standard Nomenclature of Athletic Injuries). In this series there were also 8 cases of concussion, but at least 5 of these were 2nd degree, many cases of 1st degree concussion not even bothering to seek attention.

In his discussion on concussion, Hirata states:[11] '. . . the dire possibility of serious intracranial injury must always be kept in mind, and, accordingly, all so diagnosed concussions (all instances of loss of consciousness beyond a momentary interruption of affect as well as all cases of retrograde amnesia with or without loss of consciousness) are arbitrarily barred from contact for no less than 10 days'.

How often do we apply this rule to our rugby players?

While there were no fatalities in this series, it should be remembered that even though protective equipment is worn in American football, head and neck injuries continue to be the most important lethal factor. We have no figures on the incidence in South Africa.

How should one, then, attempt to decrease the number of head and face injuries and prevent possible fatalities without resorting to helmets and the like? Control is once again the answer. Greater self-control by the player and a stricter application of the laws of the game by the referee will undoubtedly decrease the number of face and head injuries. The question of possibly increasing the number of officials controlling the game could be investigated. This would enable any illegal play to be spotted more easily, and thereby eliminated. The coach's influence in forming the attitude of his players is of paramount importance. The meaning of 'dangerous play' as stated in the book of rugby rules, should be appreciated by all concerned, and a player using his boot in a loose scrum should be removed from the field of play.

Although not included in the survey, dental injuries are relatively frequent occurrences. It is felt that the wearing of gum-guards should be encouraged, and it is interesting to note that their use is compulsory in some countries.

Acromioclavicular Separation

There were 19 cases of acromioclavicular joint separation. A few were 1st-degree, the majority 2nd-degree and 3 were 3rd-degree injuries. The 3rd-degree separations

were secured at operation by means of a transverse screw and direct ligament suture.

These cases should be compared with similar American football surveys where shoulder pads were used, e.g. out of 290 injuries in the USA Air Force, there was no such joint injury; and out of 275 injuries at Yale[11] there were only two 1st-degree and one 2nd-degree injury.

Correctly worn shoulder pads have been shown to protect against acromioclavicular separation, but they do not affect the main aetiological factors, which are incorrect tackling and poor technique in falling. Slocum[9] states that most professionals in American football 'do not fall on the point of the shoulder because of previous training and developed agility'. He goes on to say that 'most clavicular fractures are due to the failure of the players to absorb proper coaching techniques'. More time should be allocated for exercises that develop skills such as those of falling. How often have we not seen how the star athlete, transferred directly from the track to the rugby field, displays incredible lack of agility and skill in falling, and thereby runs a high risk of sustaining an injury, especially of the acromioclavicular joint.

The correct tackling technique has been referred to under 'knee injuries'.

Quadriceps Haematoma

This is also known as 'charlie-horse' or *lamboud*. Although quadriceps contusions occur in almost every game, they can be the team doctor's nightmare. Most of them pass over without much fuss, yet the occasional massive haematoma occurs without any initial warning sign to differentiate it from all the others, except that the patient with the massive bleed frequently gives the story of feeling dizzy or fainting 2 to 4 hours after the injury.

In this series there were eight large 'charlie-horses', with an average recovery period of 4 weeks, although some took 2 months and more. No cases of myositis ossificans were noted. It should be stated, however, that none of the 8 serious haematomas presented in time to receive the basic initial treatment of ice, compression and elevation. It is felt that all, even minor haematomas, should be given this basic initial treatment, because, as mentioned, there are usually no signs at first to differentiate the massive bleed from the localised one.

Practice Sessions

Thirty-one per cent of injuries occurred during practice sessions—admittedly there were many more practice hours than match hours—but this incidence is considered to be far too high. Again, the incidence in *koshuis* practices is higher than that in senior team practices, underlining once more that the aetiological factors of lack of control and/or lack of skill are of importance. It is felt that improved supervision of practice sessions could decrease the injury rate. Injuries such as those that happen when a wing sprints for the line only to be heavily tackled by the fullback, are unnecessary, since the movement should be stopped before the moment of impact.

More emphasis should be placed on the skills of co-ordination, and on how to tackle and how to fall. Although it was impossible to prove in the present study, it is felt that improved skill in the execution of play will lead to a reduction in the injury rate.

There is another factor in the prevention of injury that must be mentioned. If a doctor who was well trained and experienced in sport medicine were present at practice sessions as well as at matches, he could, while working in close co-operation with the coach, pick up the minor sprains and, treating these early and vigorously, prevent them from becoming major or chronic conditions. Since the coach's main interest is the technical perfection of the team's play, he should not be required to spot and evaluate the minor injuries. The doctor should be familiar with the aberrations of movement that are the tell-tale signs of early sprain or strain.

A question that is bound to be asked is: 'is rugby worth it?'[12] While this survey does not attempt to answer this query, the view of the former team physician at Yale, Isao Hirata, should be considered. '. . . Contact sports have become too deeply entrenched in our way of life to permit blanket abolition, nor do we recommend that such a radical and unenforceable step be contemplated. For, if the truth be known, the type of youth that engages in vigorous contact sports, whatever his deep psychological motivation, considers these activities a necessary part of his life, and, given no opportunities to satisfy his need by officially sanctioned activities, he will find equally dangerous pastimes over which medical supervision is impossible."[11] It is felt that any changes advocated in the prevention and management of rugby injuries should come from doctors interested in sports medicine working in close co-operation with rugby officials. A doctor should be part of the team of selectors, coaches and managers, and should be in contact with the players. It is here that we lag far behind what is being done elsewhere.[2,8,11]

There is a very strong case to be made for the introduction in this country of the 'sports generalist', the doctor of first contact, who is aware of the problems and demands of the sport, and is sympathetic to the ideals and aspirations of the sportsman. He should be the adviser and should help to mould the attitudes, not only of players, but also of the coach, the schoolteacher and the referee, making them conscious of the need to prevent injuries, without making them antagonistic to his aims. He should work out health standards against which players could be measured to see if they are suitable candidates for contact sports. He should evaluate players at the beginning of the season, particularly as regards their past history of concussion, previous joint injuries, and cardiovascular status. He should initiate treatment at the moment of injury and establish an accurate diagnosis,[3] and he should be able to give an accurate prognosis, which is all the coach really wants to know. Finally, he should have easy access to consultants, particularly orthopaedic, neuro- and plastic surgeons.

In conclusion, it is felt that much can be accomplished in reducing the incidence of rugby injuries by insistence on more adequate medical coverage of practices and matches, thereby making rugby a safer game without necessarily sacrificing the features which make it, when played properly, so attractive to so many.

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