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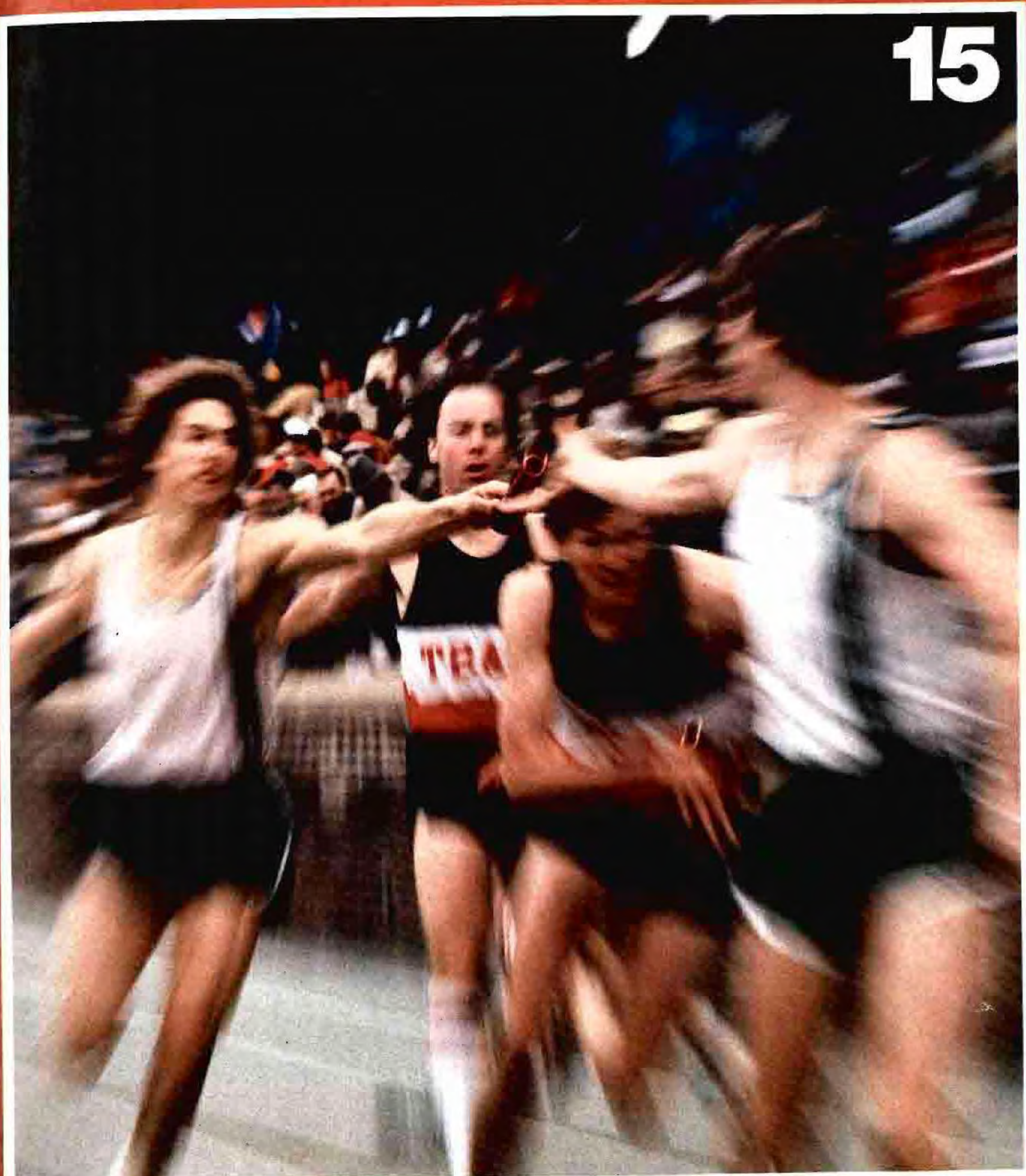

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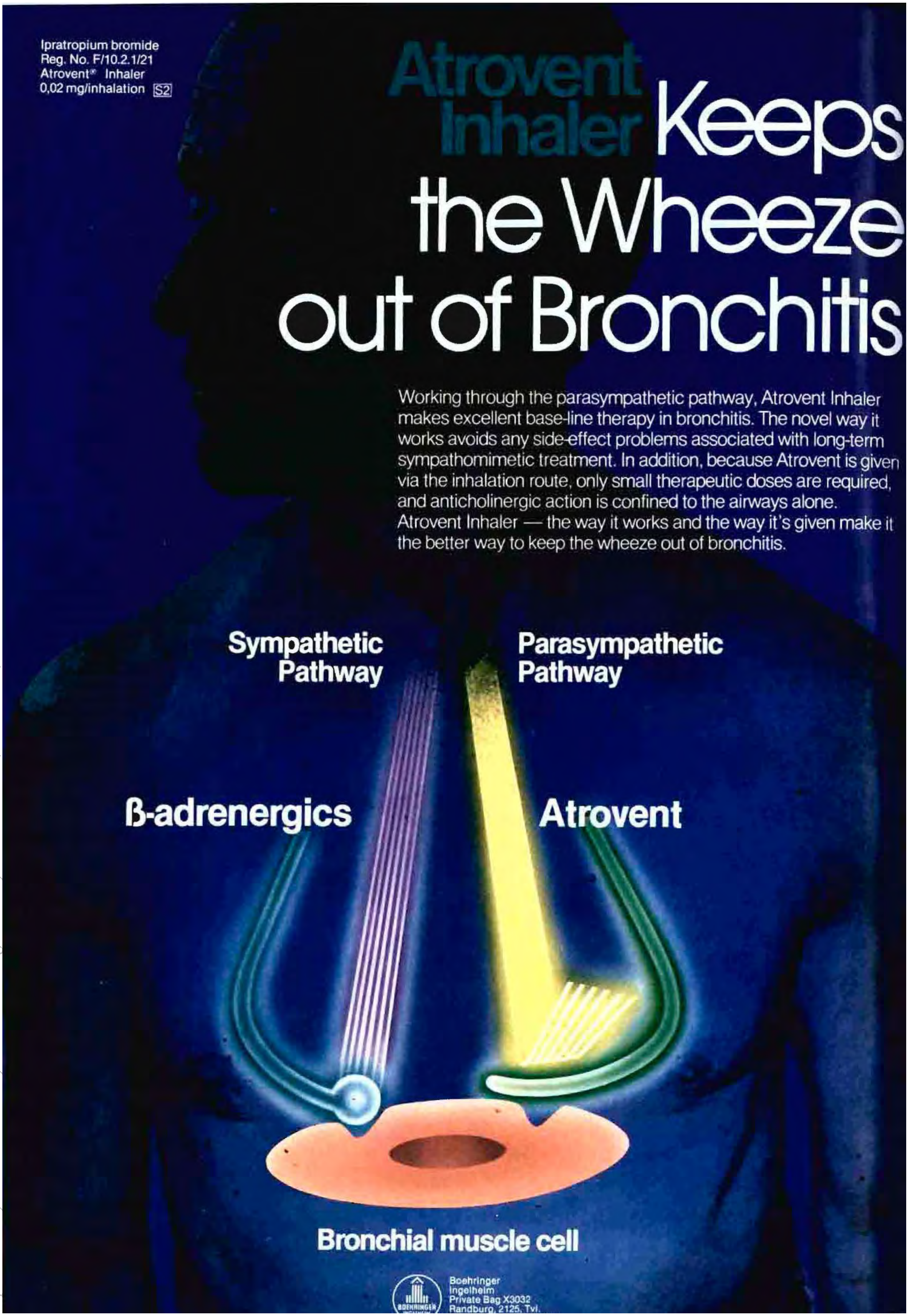
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Editorial Content

Clinical papers are invited for publishing consideration.

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World Round-Up

Most unlikely Jogging Disorders

Jogger's nipples and penile frostbite are among the most unlikely problems included in the catalogue of jogging-related disorders, according to a letter in "The New England Journal of Medicine" (1982; Vol. 306; No. 1 page 50).

The letter was written by Colm O'Herlihy, M.R.C.O.G., National Maternity Hospital, Dublin, Ireland.

"The response of two recently treated patients suggests that running habits should also be considered in the management of an ovulatory infertility", adds the writer

Both women were in their mid-20s and neither had menstruated for over a year after they had stopped using oral contraceptives. The first patient who regularly ran about 30 km a week, did not respond to clomiphene citrate in doses of up to 200 mg per day for five days in each cycle.

Within six weeks after she had stopped jogging ovulation was achieved with half the dose of clomiphene, and conception followed during the second ovulation cycle.

O'Herlihy adds: "The second patient continued to run about 25 km per week and did not respond to doses of up to 100 mg per day for five days; when jogging was discouraged, she ovulated within eight weeks while taking 50 mg per day and conceived during the first ovulatory cycle. Body weight did not change in either women before conception".

"Jogging is now popular among younger women, in whom it can reduce the proportion of body fat and lead to a reduction in circulating estradiol and estrone. These changes may result in a fall in gonadotropin secretion, with consequent anovulation and amenorrhea.

"Although the cases described are anecdotal, the resumption of ovulation after jogging had been discontinued and during administration of a dose of clomiphene citrate that had recently proved ineffective suggests that a history of vigorous regular exercise should be considered if agents inducing ovulation have failed in standard dosages."

Swimming a Skin Hazard?

General practitioners are often consulted about problems related to swimming and the most common of these are usually associated with the skin, says Dr John Woodward, a British GP.

In an article in *'Pulse'* (July 25, 1981) he looked at potential hazards at the side of the swimming pool

Dr Woodward writes: "There is widespread reaction to that bane of sports teachers and pool attendants — the verruca. If it were to be called the simple wart that it is, there would probably be much less fuss and fewer frenzied attempts to remove it as quickly as possible.

"It has never been shown objectively that it is more infectious in swimming pools than anywhere else, and the virus which causes it probably spreads as readily on the undisinfected floors of school changing rooms or household bathrooms as it does on the chlorinated sides of a pool."

Treament instructions are:

- The wart should be covered with a plaster, one without a dressing so the adhesive can help to peel away the skin surface.
- It must be pared down with a razor blade or pummice stone every night; and
- A drop of salactol, glutarol, trichloracetic acid or another keratolytic should be applied before putting on another plaster for the next 24 hours.

It often takes many months before the lesion disappears.

Sometimes children are reprimanded by pool staff for bringing their dirty skins to the swimming pool. Comments Dr Woodward: "There is no justification for this attitude as acne is in no way infectious and this censure just adds to the young person's embarrassment about the condition."

Chemicals in pool water may make eczema or psoriasis more troublesome, but some patients actually report a benefit from swimming, especially when the pool is in the open air, which is, of course, also a good treatment for acne.

Some pool swimmers develop an allergic or chemical conjunctivitis to the chlorine in the water. Treatment with hydrocortisone eye drops is speedily effective but rarely necessary as most cases clear within a few hours of leaving the swimming bath.

Ear disease is another problem frequently discussed with GPs. Dr Woodward's advice: "Normal eardrums feel uncomfortable at the bottom of the deep. Even if the pressure-levelling trick of swallowing is carried out, a drum which has been infected may be more likely to perforate in these circumstances. It is probably wiser to curtail swimming for a week or two after an attack of otitis media."

Diving and Spine damage

A Canadian study shows that diving is a frequent and potentially preventable cause of spinal cord injury.

Results of the study undertaken by Dr Charles H Tator, Head, Acute Spinal Cord Injury Unit, Sunnybrook Medical Centre, Toronto, et al are published in the *Canadian Medical Association Journal* (May 15, 1981, 124 . 1323 - 1324).

In the retrospective study of 358 patients in Toronto with acute spinal cord injuries, four main causes of injury were identified: traffic accidents (34 per cent), work-related accidents (29 per cent), sport and recreational accidents (15 per cent) and falls at home (9 per cent). Of the 55 sports and recreational injuries 38 (11 per cent of all 358 injuries) were due to diving accidents.

Tator et al analysed the spinal cord injuries sustained in diving accidents and suggested ways of preventing them.

Of the injured divers, 32 were male; the median age of patients was 21.

Most of the injuries occurred in vacation districts, 35 in lakes; only one injury occurred as a result of diving into a swimming pool. The late afternoon was the most frequently recorded time of injury.

Only six of the 25 patients with complete spinal cord injuries at the time of admission showed any recovery at the time of follow-up (though three had died by this time), whereas nine of the 12 patients with partial cord injuries who were available for follow-up examination showed improvement.

The authors suggest that educational programmes about the hazards of diving into shallow water should be conducted in the spring and summer each year.

"The medical profession, the Canadian Red Cross Society, St John Ambulance, the Ministries of Health and Education, and the media could each play a role," they state. "Signs warning against the hazards of diving into shallow water should be mandatory at public schools and beaches, and their use encouraged in all private swimming pool areas. Reckless diving must be regarded as one of summer's main hazards."

Squash still takes greatest Eye Toll

Serious eye injuries are still much more frequent in squash than in any other bat and ball game according to a British study.

The study was undertaken by G V Barrell et al and published in the *British Medical Journal* (1981, 283:893-895)

The records of 118 patients treated at Southampton Eye Hospital during 1978-79 for injuries incurred while playing squash, badminton, tennis, table tennis, cricket, and football showed that severe eye injuries were rare in squash players — but much more frequent than such injuries in other sports.

Less serious injuries — those requiring treatment as an outpatient — were also rare, with a frequency comparable with that of similar injuries in football and badminton

The investigators stated· "Squash players are most unlikely to incur an eye injury, but should this occur it has far-reaching consequences both in the short and long term Each individual player must weigh these chances and consequences against the possible inconvenience of using some form of eye protection."

They pointed out that the likelihood of a more serious injury from a squash ball was much greater than that from the ball in all the other sports studied.

The squash ball was particularly dangerous because if fitted well into the anterior part of the orbit of the eye and because it travelled fast (up to 193 km/h)

The study showed that the ball caused 19 of the 23 eye injuries of squash players who were treated at Southampton Eye Hospital as outpatients. I M North *(Med J Aus* 1973, 1·165-6) also found that the ball caused 22 of the 28 more serious eye injuries incurred while playing squash.

Barrell et al found that in inpatients the squash ball had by far the highest rate for eye injuries — 1,7 injuries per 100 000 sessions played. The highest outpatient injury rate was from the shuttlecock in badmington, 2,5 per 100 000 sessions played, followed by the squash ball 2,0 and the football 1,7

Ocular injuries in Sport

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Although the eye may be injured by both direct and indirect trauma there are a number of protective mechanisms that exist which may prevent serious injury to the eyeball. Firstly the eye is embedded within the bony socket and is surrounded by thick buttresses of bone formed superiorly by the frontal, inferiorly by the maxillary bones and nasally by the bridge of the nose. Temporally it is less well protected and in fact most ocular injuries are due to objects coming from the temporal side.

Secondly the eye has no firm attachment and is surrounded posteriorly by a pad of fat which tends to cushion the effect of a direct blow to the eye.

Thirdly the blink reflex, automatically brings a pad of tissue containing skin, muscle and tarsal plate in front of the eye as a rapid response to a threatening ocular situation. Other protective features are the reflex secretion of tears (which wash away foreign material) and the fact that the eye rotates up 15-20° when closed, bringing a greater part of the anterior surface of the eye under the protection of the frontal bone.

In injuries to the face, the eyes may frequently escape serious injury — because of these protective mechanisms.

Most injuries to the eye are due to direct trauma but the eye may also be injured by indirect trauma — when an injury to some part of the head may result in damage to the eye. This is usually the result of recurrent intermittent blows to the head, e.g. as seen with boxers. A number of retinal detachments have been observed in boxers — sometimes years after their boxing careers have ended.

Types of Sport Injuries

Ocular injuries in sport are usually due to direct injury and may be the result of either a blow or a missile.

Blow (Blunt) Injuries. This type of injury is common in contact sports — such as boxing, rugby, soccer and wrestling. The clinical effects are dependent on the severity of the blow.

Missile Injuries: Missile injuries occur in squash, tennis, cricket and hockey. The effects of the injury are determined by the size of the missile and the speed at the point of impact e.g. a tennis ball travelling at a relatively slow speed is more likely to produce a periorbital haemorrhage than severe damage to the eyeball.

In a clinical study of severe ocular trauma (1) — producing intra-ocular bleeding, sporting injuries accounted for 6% of the total cases — 22 out of 370 patients. The sports involved were.

Squash	4
Soccer	4
Tennis	3
Cricket	2
Rugby	2
Hockey	1
Boxing	2
Wrestling	2
Horse-riding	2

The true incidence of eye injuries is difficult to establish as many relatively minor injuries are never reported. Clinical impressions are that ocular injuries in sport are on the increase. The majority of ocular injuries appear to be due to squash (2) (3). The size of the squash ball is smaller than the size of the orbit so that the surrounding bones do not provide protection to the globe (e.g. as in the case of a tennis ball). In addition the squash ball travels at great speeds increasing the risks of serious ocular damage.

Sportsmen wearing spectacles: A serious hazard exists for sportsmen wearing spectacles. Glass lenses may break, even after relatively minor trauma — from either the ball or racquet — resulting in sharp fragments of glass which may produce lacerations of the globe.

Spectacles in sport should be made of plastic or unbreakable glass.

Classification

Injuries to the eye and orbit may be classified as —

1. Extra Ocular
2. Ocular — (a) non-perforating
   (b) perforating

In sports injuries both extra ocular and ocular injuries may occur. Some of the commoner eye injuries will be discussed.

1. Periorbital Haematoma (Black-eye)

The vessels of the eyelid are poorly supported and rupture readily after injury producing haemorrhages in the eyelids. These are often tense swellings making it difficult to examine the underlying globe. Periorbital haemorrhages absorb completely and their absorption may be facilitated by the use of ice packs or enzymes. The main importance of this condition is to exclude damage to the eyeball.

2. Subconjunctival Haemorrhages

This type of haemorrhage is common after an injury to the eye. In itself it is of no significance. Damage to the globe must be excluded.

3. Fractures of the orbit

Orbital fractures are usually due to a direct blow — not infrequently seen in rugby. The fracture is usually through the ethmoid or maxillary bones and presents with peri-orbital haematoma with surgical emphysema — displacement of the globe, decreased ocular movements and diplopia. In symptomatic cases, treatment is surgical — to explore the fracture site and free ocular muscle which may be trapped.

4. Corneal Abrasions

Abrasion of the corneal epithelium may occur after a direct injury. The pain is usually severe, associated with photophobia and blepharospasm. The cornea stains with fluoresceine. Treatment consists of pressure pad, antibiotic drops and cyclopegic drops. The corneal epithelium usually regenerates within 72 hours.

5. Traumatic Iritis

Iritis following trauma results in ocular pain, photophobia and blurred vision. On examination of the eye there is circumcorneal infection and the pupil is constricted. The anterior chamber has cells with a flare present. Management consists of topical steroids and cyclopegics.

6. Traumatic Hyphaema

Bleeding into the anterior chamber occurs after severe ocular injury — and a blood fluid level may be seen. The amount of blood varies with the severity of injury and the prognosis is dependent on the size of the bleed. All patients with hyphaema should be hospitalised to exclude a secondary bleed. Management consists of bed rest, eye pad, topical pilocarpine and cycloplegic. (1). Early surgery to drain large hyphaemas which do not respond to conservative treatment, will often prevent serious complications of glaucoma, corneal bloodstaining, thrombosis and fibrous membranes.

7 Perforations of the Globe

Perforations of the globe in sports injuries are usually due to fragments of glass from broken spectacles. These lacerations may be corneal, scleral or corneo-scleral — and are usually associated with iris prolapse. It is important to protect the eye from further injury by means of a pad and shield. Management involves immediate surgery to repair the laceration and remove any intra-ocular foreign bodies that may be present.

Other injuries that may occur with sports injuries are — vitreous haemorrhages, Commotio retina and retinal detachments, macular hole, traumatic cataract and dislocation of the lens.

After any ocular injury it is important to examine the retina carefully — through a dilated pupil to exclude any retinal tear — and to measure the intra-ocular pressure to exclude the onset of traumatic glaucoma from damage to the angle.

Prevention of ocular injury in sport

Unfortunately very little is being done to prevent ocular injuries in sport. The use of protective goggles and helmets should be actively encouraged by sports officials — especially in high risk sports such as squash. A register of ocular injuries should be kept to give an accurate incidence of sports injuries. Sportsmen wearing glass spectacles should be banned from playing — until they change to unbreakable lenses.

Summary

Some of the commoner ocular injuries in sport have been described. Most ocular sports injuries appear to be associated with squash — although a register of sports injuries should be kept to give a true incidence.

More active steps need to be taken in the prevention of ocular injuries in sport.

Fig. 1. Subconjunctival haemorrhage. Exclude serious damage to the eyeball

Fig. 2. Surgical emphysema from ethmoid — rugby injury.

Fig. 3. Corneo-scleral perforation with iris prolapse.

Fig. 4. Contusion injury — traumatic hyphaema.

Fig. 5. Corneal abrasion staining with fluoresceine dye.

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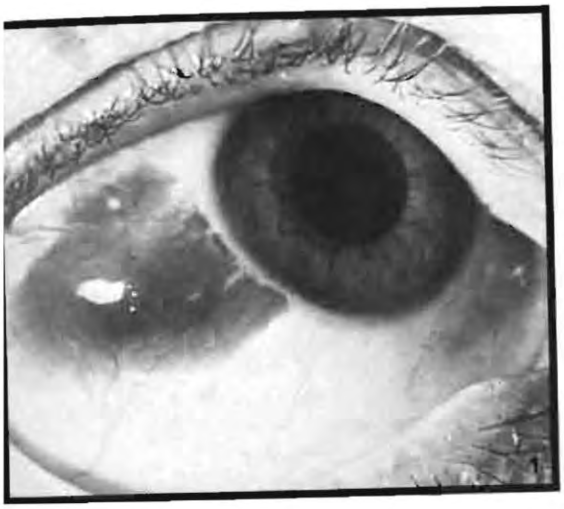
ORTHOPAEDIC QUIZ

ANTERIOR CRUCIATE LIGAMENT INJURIES

(1) What is the commonest mechanism of injury?
(2) What is the best test to demonstrate the injury?
(3) What is the commonest late presentation of a chronic injury?
(4) What injury may be mimicked by an "isolated anterior cruciate ligament rupture"?

(answers pg 16)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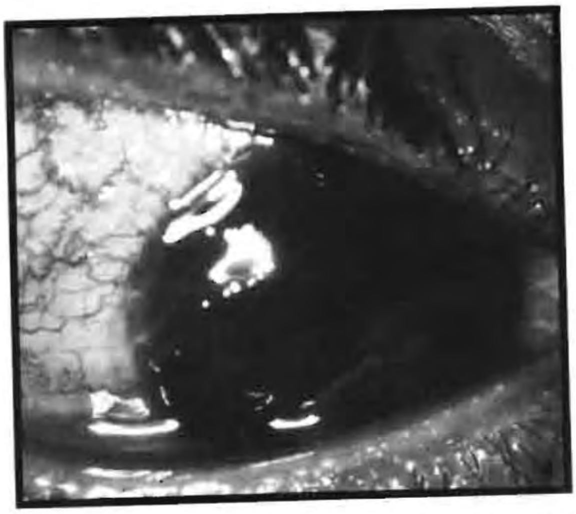


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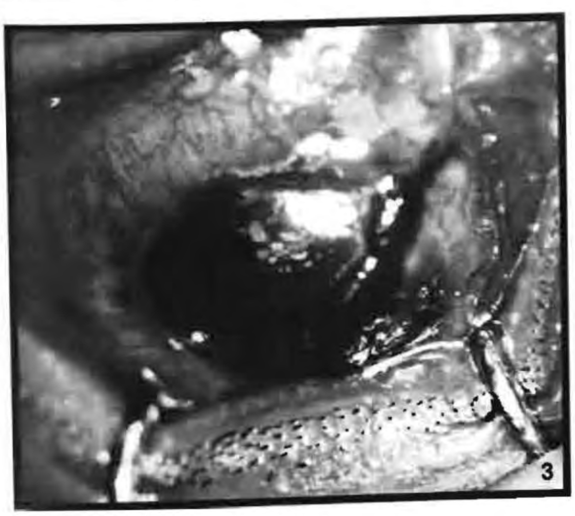
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Training Guidelines and Sample Schedule

J. Halberstadt MBA (Oklahoma)
Johannesburg

Whether you are a starting-out runner or a seasoned champion, most of the principles involved in sensible training are the same. The only significant difference is the workload in terms of distance and speed.

The overriding rationale of training is to place the body under gradually increasing amounts of appropriate stress in the work phase, with the system adapting and getting stronger during each rest phase in between. That sounds simple enough, but the trick is to come up with a combination of work and rest which leads to positive results. Overwork with not enough rest breaks you down instead of building you up. Yet with not enough stress in the work phase, the body stays at the same fitness level, or gains fitness at a sub-optimal rate.

Of course, the type of stress under which the body is placed is also a critical factor. Training should be specific to the individual runner's needs and goals.

The key concept of specificity

Specificity is the principle which says the closer your training resembles your competition, the more effective it will be. Hence, bicycling is more specific to running than bench presses, and therefore better training for a runner. Obviously, the most specific training for running is running. Following this logic further, if all your body gets to adapt to is long, slow distance, then the only type of runner you can expect to become is a long, slow distance runner.

The key then is establishing the correct mix of specific stress ingredients — speed and endurance work, and knowing when to do which, and how much of each to use.

Many world-class runners, such as Bill Rodgers and Alberto Salazar, have found that speed and endurance are separate elements of running which are best trained for specifically. Their training programmes alternate short speed workouts with slow endurance workouts. The speed workouts do not stress endurance. The endurance workouts do not stress speed. But the resultant runner is a cross between a tortoise and hare — a fast long distance runner.

Guideline schedule

The following guideline schedule takes the above principles into account. It can be adapted to suit almost any distance runner since it is based on the individual runner's perceived effort rather than on the time taken to run a set distance.

Day 1: "Long" run. The speed during this run is unimportant. What we're aiming for is getting used to spending time on the feet. A runner training for Comrades, for example, who is not used to long runs, should start off with, say, a one-and-a half hour run the first week, and increase the time run by 15 minutes each week until three hours are covered during this weekly run. Intermittent walk breaks are okay if required. A middle-distance runner should aim to build up to two hours.

Day 2: Rest day. No running or up to 10 kms at a very easy pace.

Day 3: After 15 minutes easy running to warm up and get loose, run five sets of three-minute efforts at a hard pace, followed by three minutes at easy to medium pace. No rest between sets. Run preferably on undulating terrain. Fifteen minutes warm down.

This workout is designed to most efficiently stress the oxygen transport system. The three-minute time periods are critical because hard efforts for longer than three minutes can put one too far into oxygen debt, and for efforts of shorter duration, the oxygen transport system is not stressed sufficiently.

If, by the fifth set, you are overly tired, you know for the next week that you need to run the three-minute efforts slightly slower. On the other hand, if you find you can handle the workout fairly easily, you need to upgrade your personal evaluation of "hard" pace and "medium" pace.

Day 4: Ten to 16 Kilometres at an easy pace.

Day 5: After 15 minutes warm up, choice of:

1) On track, outside lane, run hard from the middle of one bend to the end of the next straight (approximately 150 m). Ease off to a medium pace until the middle of the other bend (approximately 50 m). Repeat. Keep going for 20 minutes.
2) On the road, or on grass or unpaved surface alongside the road, run "telephone pole pick-ups". This entails running hard for one pole, easy one pole, hard two poles, easy one pole, hard three poles, easy one pole, and repeating the series. Keep this up for 20 minutes. Fifteen minutes warm down.

Day 6: Easy day. Ten to 16 kms at comfortable pace, but including six to 10 x 50 m pick-ups with full recovery, somewhere along the way.

Day 7: Race of up to 30 kms, or race simulation over a distance of 10 to 21 kms.

From week to week as one gets fitter, the actual speeds run during the "hard" and "medium" phases of the speed workouts will increase, even though the perceived "hard" and "medium" efforts remain constant. The beauty of perceived effort training routines is that they teach the runner to race according to perceived effort as well. They allow for a more accurate assessment of maximum current capability and pace judgement.

The overall philosophy behind the guideline schedule above, is that it is better to err on the side of undertraining rather than overtraining. Thus the schedule:-

1) advocates just one training session per day This is because research has shown that it takes the body at least 24 hours to fully recover from, and adapt to, a hard workout.
2) follows the physiologically sound hard/easy approach to training — a hard day is followed by an easy day.
3) revolves around three key workouts a week — the long endurance run on Day 1, and the two speed workouts on Days 3 and 5.
4) incorporates three principles which should apply to everyone in the running game· moderation, progression and variation.

By avoiding the pains, woes, long-term fatigue and injury that can result from overwork, training can always be what it is supposed to be — a stimulating, challenging and totally worthwhile undertaking aimed at uncovering the better performer and person that lies dormant in each one of us.

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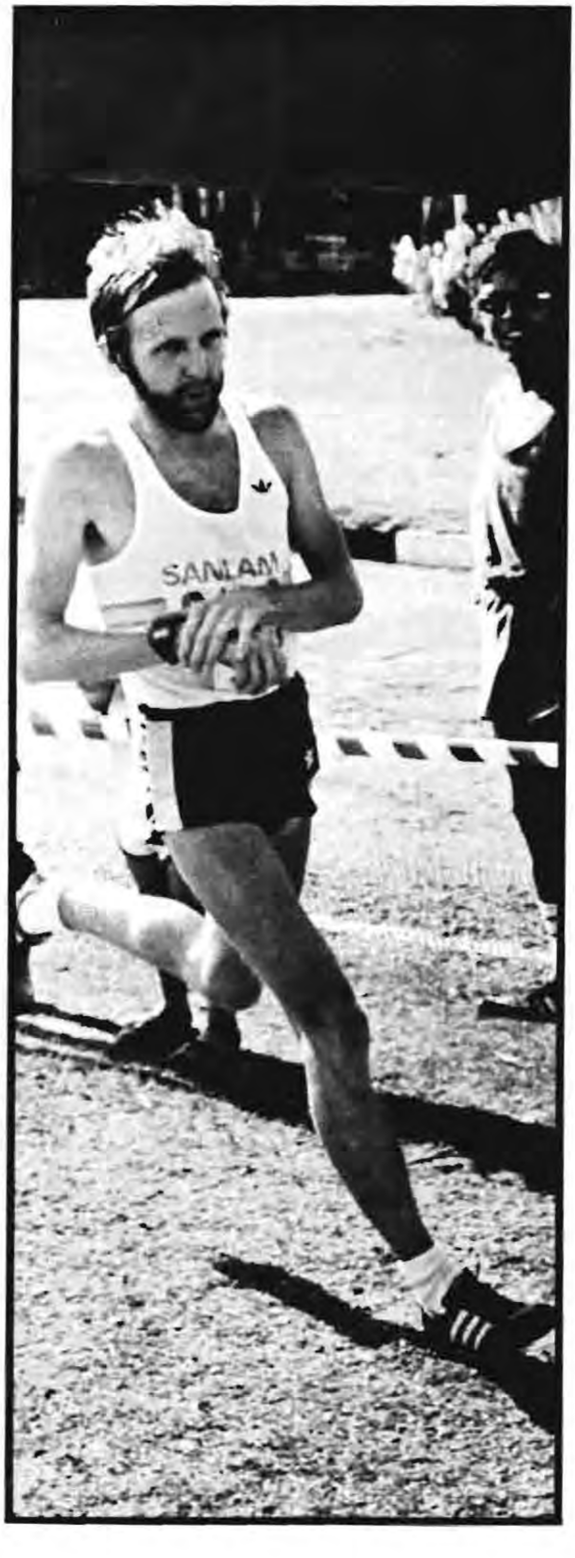

The Author

Prolonged Pronation–More than just a Runner's Quirk

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Try this quick sports medicine quiz: What role does prolonged pronation of the sub-talar joint have in the aetiology of injuries in long-distance runners?

Chances are that if you cannot answer that question, and if you are seeing injured runners in your medical practice, then you are being less than effective. It may be that your services represent little more than a brief encounter in the runner's untiring search for the optimum medical care.

For it turns out that there is now good evidence for a biomechanical explanation for the majority of running injuries. And prolonged or excessive pronation of the subtalar joint figures strongly in that explanation.

Historical background

The possibility that the foot, and in particular, the ankle joint could be of importance in running injuries was first mooted in the late 1960's and early 70's by Dr. George Sheehan, a cardiologist and marathon runner from Red Bank, New Jersey. At that time, Sheehan wrote the world's only medical column in a running magazine. Through this pipeline to the running world, Sheehan first espoused the wrong way of treating running injuries, the ways he had learned at medical school. Then the runners taught him the correct ways.

In his very first column, Sheehan answered a question about the treatment of knee pain. He gave the traditional orthopaedic advice. The pain was almost certainly due to condromalacia patellae — and the treatment was rest, physiotherapy, drugs, and strengthening exercises for the quadriceps muscles. If all else failed, there would have to be cortisone injections and ultimately knee surgery. Even then, the outlook was grave. In the early 1970's most runners with knee pain soon became ex-runners.

But a distinctive feature of those who consult by mail, is their frankness. So Sheehan soon learned that his advice was particularly ineffective and that if he cared to listen, his mail-order patients would educate him. So they told him that knee pain could often be helped by other procedures, like running on the outside of the foot with the toes pointing inwards. Or by changing to different running shoes, or by wearing heel raises for short legs, or by running on a particular road camber. Later Sheehan met a New York foot specialist, Dr Richard Schuster who was experimenting with the use of in-shoe supports (orthotics) in the treatment of running injuries, in particular knee injuries. When an orthotic prescribed by Schuster cured his otherwise incurable knee and achilles tendon pain, Sheehan felt it was time to advise his medical colleagues of these revolutionary ideas. But his paper submitted to the appropriate medical journal, was politely returned with a note to the effect that a few swallows do not a summer make.

But if the doctors were not yet prepared to embrace this heresy espousing the importance of abnormal foot function in the causation of running injuries, the economic and medical implications soon became apparent in the market place. Virtually overnight, the only persons in the United States with any practical knowledge of foot function, the podiatrists, became the principal and most sought-after providers of medical care to injured runners. Of course, the rapidity with which this occurred, lead naturally to some abuse. Not all podiatrists had the specialist knowledge needed to treat runners. And their fees seemed unnecessarily exorbitant, even by United States standards. Yet one could argue, as some podiatrists did, that the money was well-spent if it allowed an otherwise crippled runner to continue running.

Coincidental with the acceptance of podiatry by the runners, some more enlightened medical doctors began to look more carefully at their concepts. One of the first, Dr. Stan James, a runner and one of the leading sports orthopaedic surgeons in the United States, concluded that the podiatric concepts were valid because 46% of the injured runners who consulted him were helped by the prescription of an orthotic device for use in their running shoes[1].

One year later, the biomechanics laboratory with which James works, studied those injured runners who had been cured by prescription orthotics. They were able to show that correctly designed running shoes and orthotics reduced the degree of abnormal subtalar joint pronation during running[2]. This study would seem to confirm the original postulate that excessive ankle pronation is the cause of a specific group of running injuries.

The proposed biomechanical basis of running injuries

During running the foot and ankle joint serves two functions. From heel strike until the mid-portion of the "stance phase" of the running cycle (the phase when the foot is on the ground) the foot adapts to the surface by rolling inwards, everting or "pronating", principally at the sub-talar joint. The importance of this movement is that it adapts to an uneven surface, and absorbs shock.

From the mid-point to the stance phase,

Table 1 Injuries probably associated with different running feet.

The Clunk Foot	The Hyper-mobile Foot
Trochanteric Bursitis	Runner's knee
Iliotibial Band Syndrome	Shin Splints Tibial stress fractures
Stress Fractures of metatarsals, femur & pelvis	Achilles tendonitis
Generalized muscular discomfort after prolonged exercise	Popliteus tendonitis

until toe-off (when the toe pushes off the ground), this inward rotation is reversed. The sub-talar joint inverts or supinates, turning the ankle into a rigid lever which allows the most efficient force transfer to the ground. Thus, in the ideal running gait, there is an early, limited degree of pronation followed sometime near the middle of the stance phase of running, by supination of the sub-talar joint.

Unfortunately, only a very small percentage of runners have a sufficiently normal biomechanical structure to allow this normal sequence of events. Most of us are saddled with feet that either do too much rolling, the hyper-mobile foot, or else they roll too little, the so-called "clunk foot". And when these feet are attached to minor malalignments in the lower limb, it becomes remarkable that any runner can escape injury.

Foot type and predeliction to specific running injuries

Depending on the gross type of foot the runner has, so the injuries to which he/she is prone and the type of shoe he should run in, can be predicted.

The "clunk" foot is the high-arched foot. It is a rigid, stable, immobile appendage that is unable to perform that most basic function of the running foot — adequate shock absorption. Due to its stability, the "clunk" foot provides a powerful lever for push-off and so it is the ideal foot for the sprinter. But, in long distance running, in which adequate shock absorption is essential, particularly during a long race or during days of heavy training when fatigued muscles lose their ability to absorb shock, the clunker is a major source of disaster. Indeed, in United States' studies, at least 30% of injured runners have this type of foot, which is usually associated with the injuries listed in Table 1.

The hyper-mobile foot is an excellent shock-absorber, but it is very unstable during the push-off phase of running. Instead of having a firm lever from which to push-off, the runner with the hyper-mobile foot is attached to the ground by a bag of delinquent bones, each going it's own way. It is this undisciplined foot that is the most important factor in the more resistant running injuries, such as "shin splints", "plantar fasciitis", "Achilles tendonitis" and "runners knee" (Table 1).

In between these two types of running feet, there is an intermediate foot which is both high arched, but it is malaligned and pronates just enough to cause injury. The danger with this type of foot is that if pronation is too well-controlled (by shoes and orthotics) the original injury may be cured, but another injury may be caused because the foot can no longer absorb shocks adequately.

Choice of running shoes for different injuries and different foot types

Until very recently, running shoes were developed without attention to the possibility that they could cause, much less prevent, running injuries. But now science, and public demand, have forced the running shoe manufacturers to produce shoes that will reduce the risk of injury. The result has been that no longer can shoe manufacturers expect to sell their shoes on the basis of how much the shoe weighs or how it looks. Instead they must now advertise their shoes on the basis of which running injuries they will prevent, and why.

From the preceeding discussion you will appreciate just how important is the choice of the appropriate running shoes for the different injuries and foot types. In particular, the two different foot types and injury categories require quite opposite shoe characteristics to compensate for their inherent weaknesses. The "clunk foot" requires a soft shoe that will absorb the shock the foot cannot. In addition, the shoe should allow the foot to pronate as much as possible, because any restriction in ankle pronation will reduce further the already inadequate shock-absorbing capacity of that foot type. In contrast, the hyper-mobile foot needs a shoe that will imprint order on the chaos; a shoe that will impart discipline to the disorderly bunch of bones. Thus the hyper-mobile foot must be encased in a very firm running shoe that will prevent excessive ankle pronation.

The more difficult shoe to design is one which limits sub-talar joint pronation, and this is the one that shoe manufacturers have begun to agonize over. One leading shoe company has recently released two adverts publicizing its own efforts to limit pronation. One advert entitled "Helping pronators to get back on their feet", shows a hospital ward with a single bed in which there is a foot, the (enlarged) five toes of which are resting on the pillows at the top of the bed. The advert then discusses the role of pronation in the causation of running injuries. Their second advert features their particular running shoe which is specifically designed to limit excessive sub-talar joint pronation. A pair of these shoes is pictured inside a drug bottle and the advert is titled: "Take two for motion sickness". That there is money in building shoes that restrict pronation is proven by the $100 price tag attached to an anti-pronation shoe developed by another rival company.

Characteristics of the different running shoes designed for shock absorption or motion control

Running shoes should therefore be designed either for adequate shock absorption or for motion control. These are two quite different characteristics which cannot be built into the same shoe. Because the more a shoe is built for foot control, the more rigid it must be, and consequently the less shock it can absorb. Conversely, the better a shoe is at shock-absorbing, the less well it can control the foot. Thus any shoe that attempts to be a happy medium will automatically be unacceptable for those whose feet are either too rigid or too mobile.

The principle characteristic that makes a shoe soft enough to be acceptable for a rigid foot, is that the shoe must have a very soft midsole. (The mid-sole is the material between the inner and outer soles of the shoe). In addition, the heel counter, the reinforced area that surrounds the calcaneus and helps to limit pronation, must be ineffective. It should therefore be made of flexible, non-rigid material. A third characteristic is that the shoe should be slip-lasted means that the shoe has been built like a slipper, and does not have a firm inner board attached on top of the midsole. This board stiffens the shoe and prevents the shoe from being "pronated", that is, rotated inwards in its long axis. A shoe without this board, that is a slip-lasted shoe, is very flexible when twisted from side to side, and therefore aids ankle pronation.

Table 2:

Motion Control	Score	Motion Absorption	Score
New Balance 660	3	New Balance 730	5
Nike Equator	4	Saucony Jazz	6
Adidas Marathon Trainer	8	New Balance 660	7
New Balance 420	8	Tiger Ultra-T	10
Adidas TRX Trainer	11	New Balance 420	11
New Balance 730	11	Adidas TRX Trainer	12
Saucony Hornet 84	14	Saucony Hornet 84	13
Tiger Ultra-T	15	Tiger X-Calibre	13
Tiger X-Calibre	18	Adidas Marathon Trainer	15
Saucony Jazz	18	Nike Equator	18

Features that make a shoe resistant to pronation are obviously the exact opposite to those described above. Thus their mid-sole needs to be firm. Some manufacturers have even gone so far that they selectively increase the firmness of the mid-sole material on the medial side of the shoe, with softer material laterally. The shoe must have a firm board last and the heel counter must be rigid and durable. Another recent innovation is to incorporate additional material that attaches the heel counter more firmly to the mid-sole. This helps to prevent the separation of the heelcounter from the mid-sole, a not uncommon problem for severe pronators.

Specific running shoes for specific problems

When it became apparent that running shoes should be designed for either absorption or motion control, the need arose to grade the different models of running shoes according to their shock-absorbing or motion controlling characteristics. For the past few years two different laboratories have now undertaken such studies for two running magazines, *Runner's World* and *Running Times*. Using different techniques, these laboratories annually evaluate some 50 or more running shoe models for their ability to absorb shock or control motion. The tested shoes are then listed in the order in which they fulfill these functions. Whilst there has been considerable criticism of the tests — for example, one statistician found that there was absolutely no statistical correlation between the *Runner's World* and *Running Times'* findings and suggested that they were actually measuring different shoe characteristics without knowing it! — they are all we currently have to work on, and for this reason I feel it is useful to present their findings.

In their survey of shoes available for 1982, *Runner's World* and *Running Times* both tested 10 shoes which are probably available in South Africa. The results of their tests are listed in Table 2.

To construct this table, I listed the shoes in the numerical order in which each magazine rated them for either motion control or shock absorption, and then added the combined score. Thus, for example, a shoe that was listed 3 on the *Runner's World* survey and 5 on the *Running Times* survey would have a combined score of 8 for that particular characteristic. In this way it was hoped to even out errors contained in the way in which either survey was conducted.

In general, the results from the two surveys were not as greatly dissimilar as the statistician who studied the 1981 survey, had led me to believe they would be. But there were 2 glaring exceptions. First, the Saucony Hornet 84 ranked last for motion control in the *Running Times* survey, but fourth in the *Runner's World* article. Second, the Adidas TRX Trainer ranked last for shock absorption in the *Runner's World* testing, but was rated second by *Running Times*. I have found that the Saucony Hornet seems to be very effective in controlling excessive motion, so I would have to prefer the *Runner's World* findings for that shoe. The same applies to the data about the Adidas TRX Trainer. That shoe

Table 3:

Motion Control	Shock Absorption
1. Nike Equator	1. New Balance 730
2. Saucony Hornet 84	2. Saucony Jazz
Tiger Ultra-T	3. Nike Yankee
Adidas TRX Trainer	4. Puma Fast Rider
5. New Balance 660	5. Adidas Oregon
6. Puma Fast Rider	Tiger Ultra-T

seems harder than *Running Times* found it to be.

Relevance of the Tables

The tables act only as a general guide to the type of shoe that one might prescribe for a specific injury. If the injury is likely due to inadequate shock absorption, obviously one should prescribe a shoe that scores high on shock absorption. Alternatively, "shin splints", "Achilles tendonitis", "Runners Knee" or "Plantar fasciitis", are best treated with shoes that score high on motion control. My own **current** "prescribing" list for the different shoe characteristics is listed in Table 3.

An important point to remember is that running shoe models are ephemeral, and the speed with which new shoe models are appearing on the market makes any listing almost obsolete by the time it is published.

Conclusion

I hope that if this article does not engender a tremendous desire to follow modern trends in the running shoe market, it will at least introduce some critical concepts in the understanding of how running injuries are caused and cured.

How will you know that what I have written is true? That is easy. Start running, get injured and then start searching for a cure. If something other than what I have written here works for you then let me know. A second revolution is not impossible.

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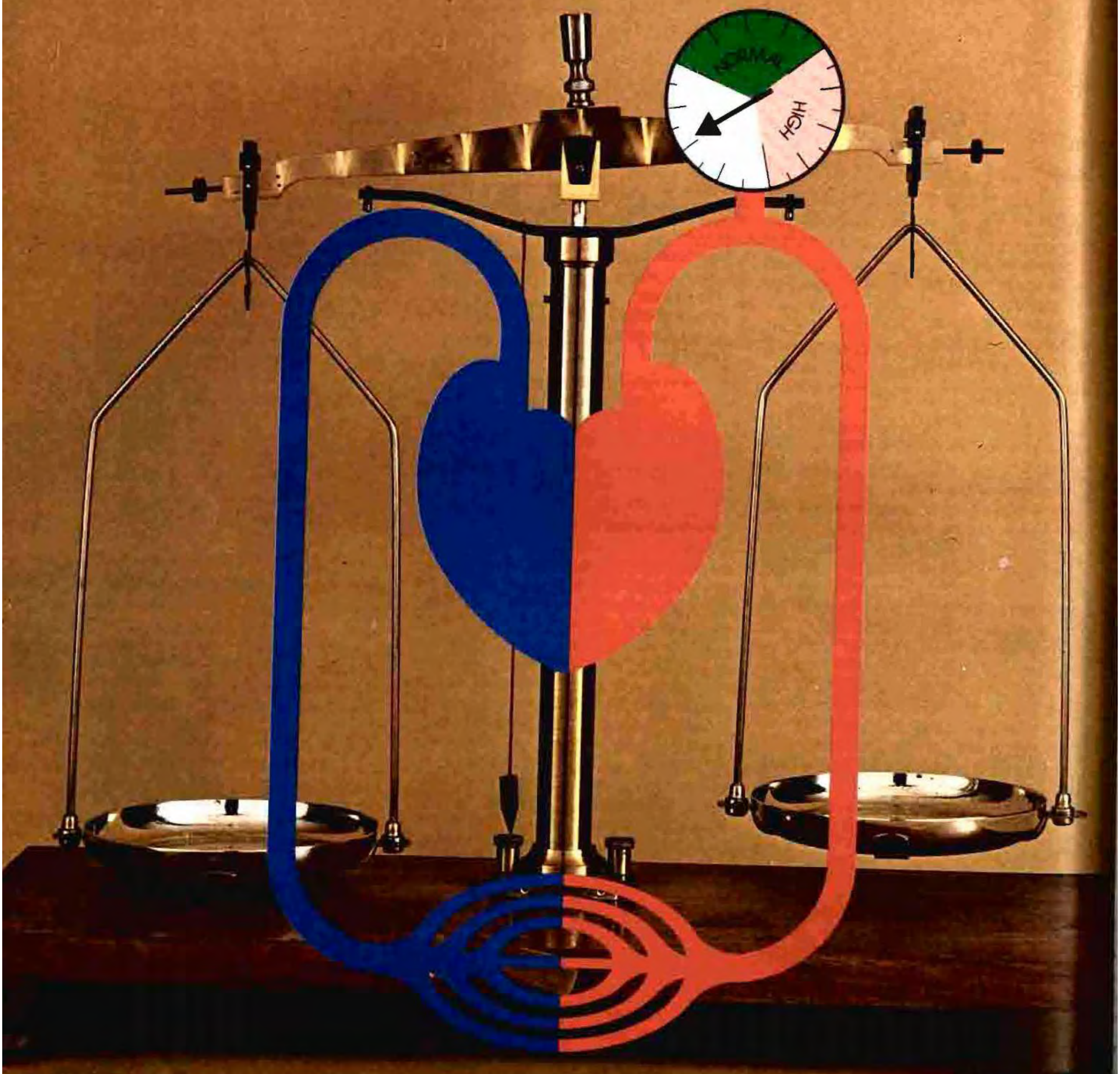

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Fused Cervical Vertebrae – Hazard in Rugby and other Contact Sports

A. T. Scher
MB. Ch.B. DMRD
Department of Radiology, and Spinal Cord Injuries Centre,
Conradie Hospital, Cape Town.

Conditions which decrease the flexibility and normal range of movement of the cervical spine predispose towards spinal and spinal cord trauma. An example is congenital fusion (synostosis) of two or more vertebrae which has an incidence of 0,4 % to 0,7 %[1] in the normal population. The majority of these subjects are asymptomatic and will remain ignorant of their congenital anomaly unless they undergo radiographic examination of the cervical spine. Any condition which predisposes to cervical spinal injury should be noted and assessed in relation to the subject's activities. The following case illustrates the relevance of the anomaly in rugby players.

Case History

A 17 year old rugby player was tackled from behind and sustained a hyperextension injury to his neck when he fell. He immediately developed intense cervical pain. On examination he was found to have severe muscular spasm, but no evidence of neurologic deficit. Radiographs of the cervical spine were reported as showing no abnormality. The patient was treated in harness traction for one week, after which time his pain disappeared and subsequent flexion/extension views were reported as showing no evidence of instability or other abnormality. He was then discharged with instructions to wear an orthopaedic collar for six weeks.

Three months later, having recommenced playing, he was tackled around the neck and again developed severe cervical pain. On clinical examination there was evidence of muscular spasm, but no other signs of abnormality. Radiographs then obtained demonstrated congenital fusion of the vertebral arches and bodies of C2 and C3 (Fig. 1.) He made an uneventful recovery in an orthopaedic collar and it was suggested that he cease playing rugby and take up a non-contact sport.

Congenital cervical fusion is the result of the cervical somites failing to divide into segments during the 3rd to 8th week of foetal life. The aetiology is as yet undetermined, except in a small percentage of patients in whom it is hereditary [2]. In its most severe form this condition is referred to as the 'Klippel-Feil' syndrome in which the cervical vertebrae are fused into a large bony mass and present a bizarre appearance. Patients thus afflicted are grossly abnormal physically, and severely disabled from childhood. More common is an isolated fusion of two vertabrae, usually at the C2/C3 level[1]. These subjects are normal in appearance and often asymptomatic, therefore the condition may only be discovered incidentally on X-ray.

Radiologic differentiation between congenital and acquired fusion may be difficult. Acquired fusion does not have constriction at the site of the fused vertebral bodies; often has osteophytic encroachment into the intervertebral foraminae and posterior bony bridging with protrusion into the spinal canal. This type of fusion is frequently the result of previous trauma, the vertebral fusion occurring as part of the (often untreated) healing of fractures.

The radiologic features of congenital fusion are; replacement of the disc space by a line of increased density, anterior and posterior constriction at the junction of the fused vertebral bodies, smooth vertebral foraminea and a single spinous process for the two vertebral bodies[1]. (see Fig. 1.).

Effects of Fusion

No symptoms can be directly attributed to the fused cervical vertebrae as those which may occur originate from the adjacent unfused segments. Owing to loss of movement at the affected area, the remaining free articulations are more susceptible to acute trauma. Eventually the increased demands on these joints, with or without trauma, may lead to instability, early degenerative arthritis or both[2]. Cineradiography has demonstrated the exaggeration of normal motion at the vertebral interspaces immediately above and below the fusion[3].

Short fusions are more easily compensated for than extensive ones. One or two remaining unfused interspaces cannot provide the motion which has been lost by extensive fusion of the cervical spine. The presence of pre-existing fusions renders the subject more liable to spinal and spinal cord damage due to the relative inflexibility of the cervical spine. Such subjects are particularly prone to hyper-extension trauma and a simple fall, which for the normal subject would be harmless, could result in significant injury[4]. Therefore young persons with fusions should, in my opinion, be discouraged from playing rugby or wrestling. These are contact sports in which the participants are subject to flexion, extension, compression and most important, rotation forces. The cervical spine is particularly vulnerable to rotational stress as the ligamentous structures upon which the stability is dependent, offer little resistance to rotatory force and are easily disrupted.

The Necessity for Radiographic Examination after Neck Injury

Any rugby player who complains of acute cervical pain after injury should be thoroughly evaluated, by both clinical and radiologic examination, to assess significant damage and to exclude possible predisposing structural weakness, as

Fig. 1. Fusion of the vertebral bodies and spinous processes of C2 and C3 with constriction at the junction of the fused bodies. There is a line of increased density at the level of C2/C3 disc space.

illustrated in the above case history.

Clinical examination is insufficient to exclude the presence of congenital abnormalities or old injuries. The detection of signs of injury on clinical examination make radiologic investigation mandatory. An extensive survey of non-fatal cervical spine injuries in American High School football players demonstrated that 50% of those who complained of neck pain had radiologic evidence of abnormality, particularly signs of previous vertebral or disc injury[5].

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ORTHOPAEDIC QUIZ
ANSWERS

(1) Internal rotation of the tibia at the knee as the joint goes into extension and while the foot is fixed.
(2) Lachman's sign.
(3) Anterior lateral rotatory instability, presenting as a knee that gives way on turning to the side of the injury. It is demonstrated by the "pivot shift" test of Macintosh.
(4) A medial meniscal tear. The torn cruciate ligament flaps into the joint preventing extension and thus appearing locked. There is also pain on the medial joint line, but Lachman's test will be positive.

Scholarship for Dr Firer

Two Snaar Viljoen Scholarships have been awarded to members of staff at the University of the Witwatersrand this year for their research on the medical treatment of sports injuries.

Dr P Firer has been awarded the scholarship for his research in the use of carbon fibre to replace ruptured ligaments in the knee. Torn knee ligaments are among the most common and disabling of sports injuries, and Dr Firer is working on a method of replacing the damaged ligament and restoring normal function. He is a member of the Department of Orthopaedic Surgery.

Dr Firer, a former Springbok hockey player, received a State President's award for outstanding achievements in sport. He has a special interest in sports injuries and in 1976 helped to establish the Sport Medicine Clinic. The Clinic is now based at the Johannesburg Hospital.

Mr Charles Parry of the Department of Zoology is the other recipient of the scholarship. Mr Parry's research deals with the mechanism of the healing of bone fractures.

The majority of fractures heal well, but occasionally delayed union, or even non-union, occurs and Mr Parry's research is directed towards uncovering the reasons for such failures.

This is the fifth year in which the scholarship has been awarded. In 1978, 1979 and 1980 the recipient was Dr Ivan Cohen, Campus Medical Officer in the Wits Campus Health Service. Last year Dr Firer was awarded R1400 to assist him to buy and maintain baboons for his research programme

Sports Medicine turns four

In addition to its educational function, the quarterly specialist review publication, **SA Sports Medicine,** is playing an increasing role as a forum for those medical practitioners with an active interest in the prevention and treatment of sports injuries and the management of sports-related conditions.

Members of the Boerhringer Ingleheim-sponsored publication's Editorial Advisory Board, who convened in Johannesburg recently to celebrate the publication's fourth anniversary, expressed their satisfaction at the rate and direction of the publication's development.

Speaking on behalf of the Board, Durban-based Member, Orthopaedic Surgeon Dr Jack Usdin, said that the sponsors of the publication, Boehringer Ingleheim (Pty) Ltd, should be complimented on their sustained interest in and support of the sports medicine cause: "By providing us with **SA Sports Medicine,** the Company has done much to promote knowledge in this specific field of medical practice. Gone are the days when we had little or no opportunity of seeking out advice or an interchange of ideas on the many sports-related conditions presented."

The Chief Executive of Boehringer Ingelheim in South Africa, Mr W Henze, acknowledged in reply that the Editorial Board's continued active interest in the publication was the major factor in the successful development and acceptance of **SA Sports Medicine.**

Rehabilitation from physiotherapists viewpoint

Dear Sir,

We are writing in connection with the article "Rehabilitasie van Sportbeserings" by Maj. J.F. Cilliers, published in the September issue of your magazine (Issue 13).

Maj. Cilliers stated that it is important that all members of the rehabilitation team work together as a unit and understand each others' specific tasks, capabilities and restrictions, and communicate with one another. In response to that statement, with which we totally agree, we feel it our duty to reply to the article from the physiotherapist's standpoint.

We appreciate that Maj. Cilliers' article is directed primarily at the final rehabilitation of the sportsman, but the details given concerning the physiotherapy treatment are not always correct. It is likewise not the intention of this letter to give a resumé of the physiotherapeutic management of injured sportsmen, but we would like to point out some misconceptions.

1. Although we fully realise the need for, and value of, a physical educationalist in the final rehabilitation of an injured

The Managing Director of the "SA Sports Medicine" sponsoring Company, Boehringer Ingelheim (Pty) Ltd, Mr W Henze (second from right), and the Company's Medical Director, Dr D Sonnenfeld (right), with "SA Sports Medicine" Editorial Board Members, Dr Ponky Firer (left) and Dr Clive Noble. The occasion was a function to celebrate the publication's fourth anniversary, which was held in Johannesburg recently.

sportsman, the role of the physiotherapist extends into this period, as well as in the acute phase e.g. we would never encourage "free squats" for patients with knee injuries unless this was specifically required for the sport being played.

2. The modality most used in the early treatment of sports injuries is ice, and definitely not heat, and certainly not light massage.
3. There is no such modality as "ultra-sound diathermy"
4. Short-wave and micro-wave diathermy are only used in chronic cases, where an increase in circulation to deep structures is required.
5. The term "fisieke terapie" is incorrectly used, and the official term is fisioterapie" — the difference being that only a registered physiotherapist should treat the patients he described i.e. immediately post-operatively.
6. An exercise can never be passive, but a movement can. Physiotherapists would use manual passive stretching techniques, but never mechanical forces to stretch an injured muscle.
7. It is standard practice for the physiotherapist to maintain the general condition of the patient, as well as his exercise tolerance. To achieve this there is no need for sophisticated equipment. Careful monitoring of the heart rate is a very reliable indication of exercise performance and any physiotherapist can monitor these patients and interpret the findings.
8. "Armergometric" is not a reliable test of exercise endurance.

In conclusion, we would like to say that we are interested in the work being done by Maj. Cilliers at Voortrekkerhoogte and we look forward to sharing our ideas.

Yours faithfully,
Lecturing Staff,
Sub-department of Physiotherapy,
University of the Witwatersrand.

Editorial Board Comment

This letter is important because it highlights the concern of many actively involved in "sportsmedicine", that the legal and ethical factors that should govern who does what, for which sportsperson, have not been clarified. In particular, there is concern that the interests of physiotherapists, occupational therapists, and physical educators in sports injury prevention and rehabilitation may overlap, yet the latter group are not registered with the South African Medical and Dental Council. Thus their legitimate role is uncertain.

As sportspersons become more knowledgeable, they will demand even better standards of injury prevention, treatment and rehabilitation. It will be important to optimize what resources we have, to provide the possible service not just in the main urban centres, but throughout the country. This should be borne in mind by those whose job it is to define the useful roles of those who wish to look after sportspersons.

For the record, and the authors' criticisms not withstanding, it should be noted that Major Cilliers works under the supervision of an orthopaedic surgeon in close collaboration with a physiotherapist.

Heart rate Questioned

Dear Sir,

Figure 1 in the article by Dr Diamond and his colleagues "Holter Monitoring and Marathon Running" (South African Sports Medicine Volume 14, December 1981) shows that 2 athletes ran for more than 60 minutes with heart rates in excess of 200 beats per minute.

I would have to think that such high heart rates are artefactual and that, for some reason, the Holter Monitor used by these workers overreads the true heart rate. My experience both as a distance-running subject and as a researcher into marathon running, is that it is exceptional to find a trained distance runner who can even *reach* a maximum heart rate of 200 beats/minute, let alone sustain it for more than a minute or two.

I ran the 1979 SABC half-marathon in the same time as the 2 athletes whom Dr Diamond et al found to have heart-rates in excess of 200 beats/minute. My pulse rate taken by digital-palpation during the first ten seconds after finishing the race, was 144 beats/minute. I would be interested to read these authors explanation for the high heart rates they recorded.

Yours faithfully,
Dr T. Noakes
Cape Town

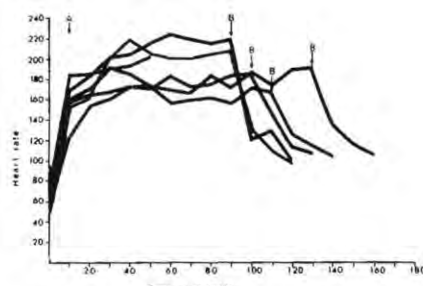


Fig. 1 Pulse trends of the athletes
A. Denotes the first recordings after the start.
B. Denotes the end of the race.

Carbon fibre debate develops

One of the most difficult problems in sports medicine today is the treatment of anterior cruciate instability. This instability is the result of a tear of the anterior cruciate ligament, usually caused by placing an excessive rotational strain on the knee. For example, sudden change in direction when running at speed. The resultant injury to the cruciate ligament is usually in association with a tear of one or both menisci.

The tear to the anterior cruciate ligament is usually mop-ended and repair to the ligament has yielded poor results. Most of the major sports medicine centres throughout the world have abandoned the repair technique in the acute stage, favouring excision of the damaged portion of meniscus and not the repair of the torn ligament Chronic instability usually presents with repeated episodes of the knee giving way painfully, followed by a variable degree of effusion.

This again usually occurs on excessive rotation and is complicated by further damage to the menisci as well as stretching of other ligaments and capsule in the knee joint, resulting in progressive disability. Some patients,by the use of their thigh musculature, are able to maintain stability despite the most rigorous sport.

As repair in the chronic case is impossible, reconstruction of the anterior cruciate ligament has been used to prevent further instability and also to circumvent the late complication of osteoarthritis caused by the excessive sharing strain on the articular cartilage. These reconstructions have either been extra-articular or intra-articular Structures which have been used in the intra-articular reconstruction have been the ilio-tibial and patella tendon, or the anserine tendons either as dynamic or static stabilisers.

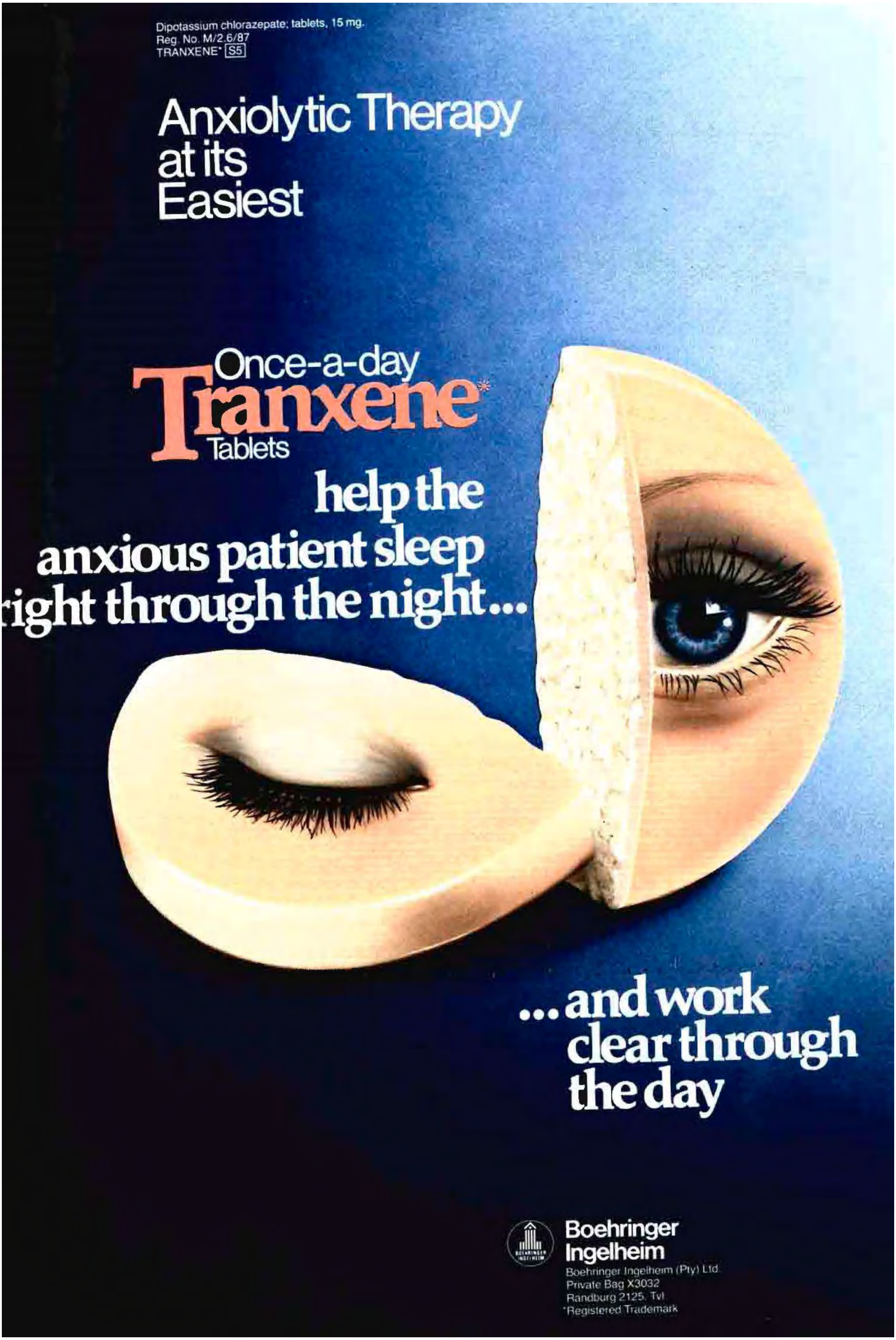
Unfortunately, results achieved throughout the world have left a lot to be desired More recently the introduction of artificial substances has brought new interest and enthusiasm into this area. The initial artificial ligaments were found to stretch and break and have, to a large extent, been discontinued

More recently in South Africa carbon fibre has been used following the work done by Jenkins, in Cardiff. Carbon fibre has the advantage of being able to induce connective tissue ingrowth in and around its filaments, so that it acts as a lattice-work for the formation of a new ligament. It also has great strength, but has minimal stretch properties. It also suffers from the fact that it is friable, so that irritation against bone edges will cause rapid fraying and even tearing, even knotting it on itself, resulting in the possibility of fraying and rupture. To this end, the Council for Scientific and Industrial Research (CSIR) has suggested the use of bollards for anchoring carbon fibre into bone and toggles for holding loops of the carbon fibre. This has resulted in a lesser tendency to fray at these sides.

Added to this, improved techniques in the surgery have also reduced the possibility of carbon fibre fraying against bone edges. However, despite these advances, fraying and ultimate rupture are still occuring.

One of the main problems, however, was the advice by the manufacturers of carbon fibre that, because of modern techniques, rapid mobilisation of the patient's knee could be achieved. It was even suggested that no plaster be required. Unfortunately, tempting this early mobilisation resulted in many cases being disasterous with rupture of the carbon fibre within 10 days.

At the present stage, the use of carbon fibre as the "saviour" of sportsmen's knees with torn cruciate ligaments, is clouded with doubt. It is possible that the use of long post-operative immobilisation will improve the results. More carefully controlled investigations are necessary to establish the accurate role of carbon fibre in cruciate repairs in sportsmen. More recently, a report in the "British Journal of Bone and Joint Surgery" has suggested that polyesters have better induction properties and also the same stretch properties as normal ligaments, and they may prove to be more satisfactory in the long run than carbon fibre.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