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PREVENTATIVE REHABILITATION FOR RUGBY INJURIES TO THE LOWER BACK AND CORE

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Providing coaches, referees, players, and administrators with the knowledge, skills, and leadership abilities to ensure that safety and best practice principles are incorporated into all aspects of contact rugby.

INTRODUCTION

Rugby is a full-contact sport which has one of the highest injury rates when compared to other team sports. Although injuries are expected from any high-speed and high-impact situation, steps have been taken to minimise the high injury rates within rugby. Law changes, cutting down on foul play, improving protective equipment, as well as increasing the emphasis on proper conditioning are to name but a few of the steps taken with the goal of reducing the risk of injury.

Trends in the nature of injury in rugby have changed since 1995 as a result of numerous modifications to the laws combined with the advent of professionalism. However, these changes have been associated with some negative consequences, such as an increase in injury risk for both professional and amateur games. As a result, a vast amount of research has been conducted on the nature and cause of injuries in rugby, and their prevention. A significant amount of this research is concerned with the risk of spinal injury associated with playing rugby.

The head, rib cage, pelvis, and spinal column form the central component of the skeleton. One of the primary functions of this central component is to absorb and dissipate forces which act upon the body; this role is mainly fulfilled by the spine and the muscles which support it. An increased possibility of injury occurs if there is a dysfunction in the protective and load distributing capacity of the spine. This is particularly evident in the lumbar spine, which can be seen as the building block for the lower back region. The lower back is an integral part of the entire movement chain as it functions as part of a complex network of the skeletal, muscular and nervous systems. Countless research hours have been spent trying to determine the exact cause of lower back pain, but as a result of the complex relationship between the brain, bones, muscles and ligaments, numerous cases of lower back pain remain unexplained.

Lower back injury is not a phenomenon exclusive to rugby players or any other athlete population; it is a global phenomenon. This is evident from the large number of lower back related disorders within normal populations. Lower back pain affects a large number of sedentary individuals and is the greatest cause for absence from work, or loss in work productivity. In South Africa this is evident by the fact that physiotherapists treat at least six patients with lower back pain per week, with 60 to 80% of the population experiencing back pain at some time in their life. In the majority of cases the mechanical cause of lower back pain will differ between sedentary and athletic populations. Normal populations tend to get lifestyle associated back pain whereas rugby players tend to suffer from back pain which is associated with exercise, rather than the lack thereof. However, the structures affected in the lower back will be the same in both population groups as their human anatomy does not differ.

MOST COMMON INJURIES

Injury to the spine in rugby occurs mainly to the cervical spine (neck); however there is also a risk of injury to the lower back and its supporting structures. There are numerous mechanical forces involved in producing spinal injuries and the most common injuries to the lower back and core occur as a result of one, or a number, of these forces acting on the lumbar spine or the surrounding tissue. These forces can be broken down into: flexion forces (forward bending), extension forces (backward bending), rotation forces (twisting), shear forces (one vertebra sliding in relation to another), and compression forces (vertical pressure). It is often the extremes of range or force that result in injury; however even a relatively small force can result in an injury if the spine is not adequately supported. The most effective way to categorise sport related injuries to the lower back is to break them down into the structures affected. These include: fractures to the spinal column, injury to the interverterbral disk, ligament strain, joint inflammation, and muscular spasm. Other less common injuries also occur, which is why an accurate diagnosis is essential before treatment.

MECHANISM OF INJURY

The research on the incidence of injury shows that the majority of injuries in rugby occur when tackling or being tackled. Tackles have been found to be the rugby event responsible for the greatest number of injuries as they are by far the most common contact event in the game. As a result they account for the greatest cause of all injuries, followed by the ruck/maul. Blind tackles occur when the player is tackled from behind or from a position outside of their range of vision (in the player's peripheral vision). There is a higher risk of injury with this kind of tackle as the player is often caught unaware, and often unprepared for the impact. The tackle with the greatest risk of spinal injury is the spear tackle, and has subsequently been banned from rugby as it constitutes foul play. Further studies have also shown that although tackles cause the greatest number of injuries it is collisions which are more likely to result in injury. Even though there are fewer collisions during a game, they are more likely to result in an injury than a tackle.

The forces involved in scrumming and the positioning of the players has always been a concern when it comes to spinal injuries. However, thanks to a greater awareness of the dangers involved in scrumming, the risk of spinal injury in the scrum has decreased. Due to improvements in refereeing and laws governing the scrum, the number of injuries as a result of scrumming has decreased in comparison with the number of injuries sustained during the ruck and maul phases. Nonetheless scrums are inherently dangerous because the players are placed into positions which have the potential to compromise the safety of the spine. As a result, scrums carry a much greater risk of injury than tackles. The majority of research up until now has focused on the incidence of traumatic injuries to the spine, especially the

cervical spine, but there is also a risk of overuse injuries as well. The forces involved in scrumming place an increased amount of strain on the lower back, especially on the discs between the lumbar vertebrae.

There is no consensus on the most dangerous position in rugby, because certain positions carry different risks for different injuries. It is however safe to assume that the positions that carry the greatest risk of injury are the ones involving the most contact and the greatest number of tackles, such as the loose forwards and certain players in the backline. However, some players have a greater risk of injury for other situations which are unique to their position; for example, props and hookers carry a greater risk for lumbar spine injuries due to their location and positioning in the scrum.

More injuries occur in higher teams (1st team) and older age groups and fewer injuries occur in lower teams (5th team) and junior levels of rugby. It has also been found that rugby matches carry a far greater risk of injury than practices, especially matches played at the start of the season. Research has indicated that most injuries occur at the start of the season or during the first few weeks following a break in mid-season. A generally accepted principle in the discipline of sports medicine is that the greatest predictor of a future injury is a previous injury. This is an important finding because the return to sport phase following an injury will carry a similar level of risk compared to the early phases of the rugby season. Most injuries result in time off, with injuries caused by tackles resulting in the greatest amount of time off. It is imperative that injured rugby players be fully recovered and conditioned before returning to game situations, in order to avoid further injury, further time off, and possibly a reduction in the length of their rugby career.

SPINAL INSTABILITY

By nature the spine is classified as being unstable as a result of its structure. Stability of the lumbar spine is challenged by a diverse range of external forces and loads acting upon it. These external forces are increased in a contact sport such as rugby. The impact involved with scrumming, tackling, diving and collisions puts increased strain on the spine and the stabilising structures which support it.

Spinal instability is classified into two categories: mechanical instability and clinical instability. The inability of the spine to accommodate external forces is termed a mechanical instability whereas clinical instability occurs as a result of pain or inadequate neural stimulation. Mechanical stability of the spine is provided by the spinal column itself and the surrounding muscles, especially when there are external forces acting on the spine during movement and loading.

Most cases of back pain occur as a result of excessive and uncontrolled movement of the lumbar spine. Under normal conditions stabilising subsystems work in harmony to provide mechanical stability to the spine. However in the presence of pain, or when there is a dysfunction in the lower back, there is a loss in the ability of the stabilising subsystems to fulfill their role. The presence of pain reduces the optimal functioning of the central nervous system and therefore the ability to maintain the muscular component of spinal stability and control.

SPINAL STABILITY

Stability of the lumbar spine requires passive stiffness through bone and ligament structures and active stiffness through muscle contraction. The passive structures provide stability through their structural composition and hence cannot produce movement. Passive structures like the ligaments are only effective at the end of range to prevent excessive segmental movement of the spine.

The active structures provide stability by contracting or tightening and play a predominant role in maintaining lumbar spine stability throughout the entire range of movement. These active structures are made up primarily of muscles located around the lumbar spine, such as the abdominal muscles. The abdominal muscles which are fundamental to the active maintenance of spinal stability include the internal oblique, external oblique, transversus abdominus, and to some degree rectus abdominus.

Essentially spinal stability requires the contraction of key muscles, individually as well as in co-operation with each other, to maintain posture and intersegmental control. To visualise this intricate stabilising system, imagine the spine as a tent pole and the muscles as the supporting guy ropes. The role of the guy ropes is to provide support to the otherwise unstable tent pole. The more guy ropes the more stable the tent pole, just as without the guy ropes the tent pole will fall over.

Recently the term “core” has become very popular in exercise therapy. The core is collection of muscular structures which form a corset/brace that functions as a support for the spine. In theory it is cylindrical in shape, made up of the pelvic floor at the bottom, the abdominals at the front and sides, the diaphragm at the top, and the spinal muscles at the back.

The core functions like an internal weight belt because the muscles involved contract together to increase the internal pressure of the abdomen, and hence the stiffness around the lumbar spine. To visualise the role of the core, imagine a soft drink can. When the can is open the thin aluminum sides can be crushed easily. When the can is closed and pressurised it is not possible to distort the shape of the can. In the case of the core, this increase in pressure is associated with an increase in muscle thickness due to muscular contraction, and is not due to the Valsalva manoeuvre (breath holding).

PREVENTION

It is important to differentiate between treatment and prevention when considering injuries to the lower back. Treatment occurs after the injury has happened, while prevention is performed to reduce the risk of the injury occurring. It is critical to note that the following section is a guideline to the prevention of lower back injuries. It is not possible to use the following section as a generalised template for treatment because no two injuries are the same. If there is any doubt over a spinal injury it is important to consult with a specialist as certain injuries to the low back can have serious consequences if not treated appropriately. These guidelines are aimed towards the prevention of injuries rather than the treatment. For the treatment of injuries it is best to seek the guidance of a physiotherapist or biokineticist.

There are currently a wide range of available exercises prescribed for the prevention and treatment of lower back related disorders, despite the fact that many have not been validated or scientifically studied. Most studies indicate that physical activity is a valuable therapeutic approach; however there is no agreement on the specific technique, intensity, or type of exercise. When reviewing the research it is clear that there is no evidence in favour of one particular exercise modality over another due to the contradictory nature of the results. This is an important finding because many rehabilitation programmes claim to be the best method for the treatment and prevention of lower back injuries. The best rugby specific protocol for preventing lower back injuries should find a balance between exercise modalities, and not just one particular mode.

Most rugby players are involved in some form of strength training programme to enhance their sporting performance and reduce the risk of injury. These exercise programmes often involve weight training to facilitate speed, strength, power, endurance, as well as muscular hypertrophy. The spine benefits from this type of training because the weight training indirectly strengthens its support system. Furthermore, there is sufficient scientific evidence to support exercise programmes which combine multiple aspects of fitness including strength training, flexibility and cardiovascular fitness. As a result there is nothing wrong with using general exercise as part of an exercise protocol to prevent spinal injuries.

Some evidence suggests that general exercise and strength training on its own can be sufficient for conditioning the stabilisers of the lower back. This research is controversial because it claimed that there is no benefit in adding exercises which place an emphasis on retraining of the core. The findings were that there is a functional difference in the relative recruitment of the abdominal muscles between general strength exercises, such as weight training, and stabilisation exercises, such as Pilates. Individuals who had a predisposition for lower back related injuries were found to activate selected abdominal muscles at lower levels of their maximum ability. It was found that following a resistance training programme these individuals could recruit a much greater percentage of their maximum. From a clinical view point of view

this implies that general exercise, if performed correctly, may be sufficient to activate the local stabilising system in parallel with the global mobilising muscles.

However, the strength training regimes that rugby players follow place most of the emphasis on the global mobilising muscles rather than the local stabilising muscles. The global muscle system, or mobilisers, include the muscles that produce noticeable movement. Some of these muscles also have a limited stabilisation role. These muscles are generally larger, stronger and take longer to fatigue. The local stabilising system comprises muscles which act at a defined location to limit undesirable movement. In most cases the stabilising muscles are not trained to the same extent as the global system and as a result are often weaker and fatigue easier.

Exercise programmes that address trunk muscle recruitment strategies are recommended for training the local stabilising system, especially if they include the relative activation levels of specific abdominal muscles. One such exercise modality which focuses on the core musculature is core stabilisation. The term core strengthening has become synonymous with lumbar stabilisation and is often referred to as core stability or core stabilisation. In essence core strengthening is used as a broad term to encompass any exercise which requires muscular control around the lumbar spine to maintain functional stability.

Core stabilisation exercises have been promoted for lumbar stabilisation and for preventing, or rehabilitating lower back related injuries because they focus on the activation of key supporting and stabilising muscles. Certain key muscles have been highlighted as essential muscles involved in core stability as their structure, function and location, fulfil a supporting role for the spine. Researchers have also found that the core muscles are controlled directly by the brain and activate prior to any movement. Deep stabilising muscles are therefore fundamental in the central nervous system's control of trunk stability and act as the centre of the functional kinetic chain. Training the spinal stabilising muscles will therefore help to maintain a healthy, pain-free lower back as they provide greater segmental control and support for the spine.

A rugby player will have increased core stability/strength and a reduced risk of injury if these internal support mechanisms have been conditioned to resist external forces from distorting or injuring the spine. Improved core stability will not only benefit players on the field during matches or practices but will also assist in preventing unnecessary injuries during weight training and preseason conditioning. Simply adding selected core stability exercises to a rugby player's exercise routine will reduce the risk of injuries to the lower back and core. It is important to clarify that it is insufficient to only train one aspect of the core, as is often the case. There is a great misconception that by performing numerous crunches and sit-ups the core will be strengthened. In fact the opposite can be true because by overloading one aspect of

the stabilising system you will leave the other areas vulnerable and weak, which is why an intricate balance of exercises is required to target all of the muscles involved in spinal stability.

CONCLUSION

If the injury rate to the lower back and core is to be reduced, coaches and conditioning experts need to implement the best practice guidelines outlined in this article. The take-home message is that adequate stabilisation of the spine is the key factor in the prevention of injuries to the lower back and core. This stabilisation is important to prevent hypermobility and loss of control around the lumbar spine. It is for this reason that exercise programmes which include core stability along with general strength training should be prescribed for rugby players to prepare them for the level of impact involved in the game, as well as for sport related weight training and non-sporting related daily activities.

AUTHOR'S BIOGRAPHY

Neil Hopkins is a registered biokineticist working at Murphy and Hopkins Biokineticists in a private hospital in Cape Town. He obtained his biokinetics honours degree from UCT, with specialist focus on the rehabilitation of lower back pain. His current work involves the treatment and rehabilitation of a variety of orthopaedic conditions, including many back related cases.