The Joint That Didn't Evolve

Andy Barker PT

Over thousands of years the evolutionary process has seen many changes that have led to the development of today's human beings. We are part of the family *Hominidae* which includes our species, *Homo sapiens* in addition to the great apes. Similarities can be seen throughout, when comparing humans to our previous ancestors. For instance, humans and the African apes both lack external tails and have hands with a thumb that give us the ability to complete opposition and thus, complete competent precision grip tasks.

As an omnivorous species, we kill other animals for food in addition to eating a wide variety of plants. Internally, our bodies have the same arrangement of internal organs and bones. We share several important blood types and as a species also get many of the same diseases.

The evolution from a quadruped gait to a bipedal gait pattern is probably the major difference between humans and our primitive ancestors. Bipedalism has resulted in structural development inducing a number of changes to allow for this form of locomotion. Unlike apes, we have shorter and weaker arms and our feet no longer have the ability to effectively grasp and manipulate objects because the toe s became shorter and the hallux has moved up into line with the others. The development of the arches of the feet in humans allows for better body support and control in standing and locomotive tasks.

The human and spinal column have been modified for an erect posture and efficient bipedal locomotion. The pelvis has become shorter, broader, and more bowl shaped. This provides greater sta bility for tasks in an upright position.

However, if you consider the mechanics of the hip we can clearly see how this joint has largely failed to evolve during the transition to movement on all fours to an upright movement pattern.

Bony congruency in the hip occurs in a position of relative flexion, abduction and internal rotation, exactly the same position as in a quadruped gait pattern. Thus, maximum joint congruency is achieved during such movement. This position is used by young children as they learn to crawl and sit. This position gives children the bony and joint stability needed given their immature underdeveloped musculoskeletal system.

In addition, during late stance of a quadruped gait pattern the centre of mass is directly through the centre of the head of the femur. So in addition to maximum joint congruency comes biomechanical optimum efficiency. In other words the perfect hip position needed for movement.

Compare this with today's bipedal gait pattern with the hip in a relative position of extension, adduction and lateral rotation giving rise to poor joint congruency. Furthermore, more load is transmitted through the anterior superior labrum during the late stance phase of gait in a bipedal position. It could be therefore not surprising that we see so many labral pathologies in this portion, 10 to 2 o'clock position.

So given the hip joint lacks both congruency and biomechanical efficiency during bipedal movement does put this joint at a movement deficiency. Adding to this some individuals are already at a bony disadvantage given our knowledge regarding pincer and cam style hip bony differences. We know how important such bony configuration is to functional movement patterns. For example, one's ability to squat is very determined by anterior labral depth. This could be considered more apparent given the non-centralised position of the femoral head within the acetabulum as discussed previously.

We therefore need to be aware of such possible physiological barriers to movement proficiency. Some athletes may not be designed to be great squatters. Their bony configuration may mean that they are predisposed to hip pathology.

This however, doesn't mean that they shouldn't squat. Just that they may need to be taught to allow for such limitations. For example, widening ones hip stance with a squat and increasing hip lateral rotation would allow more clearance of the

head of the femur within the acetabulum thus sparring any unnecessary contact between the two joint structures. This of course would be even more important for those individuals with anteverted hips. Ensuring good hip stability and low threshold activation will aid centralisation of the head of femur within the hip socket whilst good joint mobility is important to encourage unrestricted muscular and capsular movement.

The key ultimately is understanding the potential restrictions to hip joint mechanics and applying this to an athlete's movement needs. Failure to do so could mean putting our athletes at an unnecessary risk of hip pathology.

Andy Barker PT

Biography

Andy is the current head physiotherapist for the Leeds Rhinos first team squad and has been involved with the club for the past three seasons. The Leeds Rhinos are an elite rugby league club competing in the Engage Super League (England).

He graduated in Physiotherapy from the University of Bradford with a first class honours degree which followed on from a previous Bachelor of Science degree from Leeds Metropolitan University in Sports Performance Coaching.

Andy has previous experience working in rugby league at a variety of representative levels. He has also treated within National League basketball and professional golf.

Recently, Andy was appointed as a physiotherapist for Red Bull sponsored athletes, looking after competitors in a variety of extreme sports.

Andy is also the creator and author of rehabroom.co.uk. RehabRoom is a free online rehab resource site aimed at but not exclusive to physiotherapists, strength and conditioning coaches and personal trainers. To visit the site please click the link;