



Practical tips to manage malaligned players

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ABSTRACT

Tennis, due to its one-handed nature and the prevalence of certain shots such as the forehand and serve within it, lends itself to malalignments which can lead to tension, weakness, loss of power / strength, and even injury. This article introduces and discusses malalignment syndrome, and provides exercises for evaluation and treatment.

Key words: Malalignment syndrome, injury, physiotherapy, prevention

Received: 02 June 2018

Accepted: 06 July 2018

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INTRODUCTION

Swinging sports like tennis are asymmetrical in nature and can cause torque on the body's muscle and fascial systems, leading to an imbalance in length and strength of muscles and tendons. With an estimated 75% of the strokes in the modern game being forehand or service motion, the pelvic ring can become distorted or malaligned unless steps are taken to correct it. Malalignment syndrome remains one of the frontiers in medicine, unrecognized as a primary or contributing cause in over 50% of those with back and limb pain (Schamberger 2002, 2013).

Few competitive tennis players complete an entire season without experiencing some form of injury. In a healthy body, the pelvis can withstand repeated gravitational, rotational and diagonal deceleration forces along the length of the kinetic chain. But, if the pelvic ring is distorted for a length of time your body's ability to adapt is overwhelmed; this can cause asymmetries of muscle tension, strength, weight-bearing and joint ranges of motion leading to inferior performance, dysfunction, pain and ultimately injury.

An average match duration for men was found to be 146 ± 58.2 minutes while women's matches were shorter at an average of 89 ± 24.6 minutes (Morante & Brotherhood, 2005). The overall average point duration was calculated as 6.9 ± 3.1

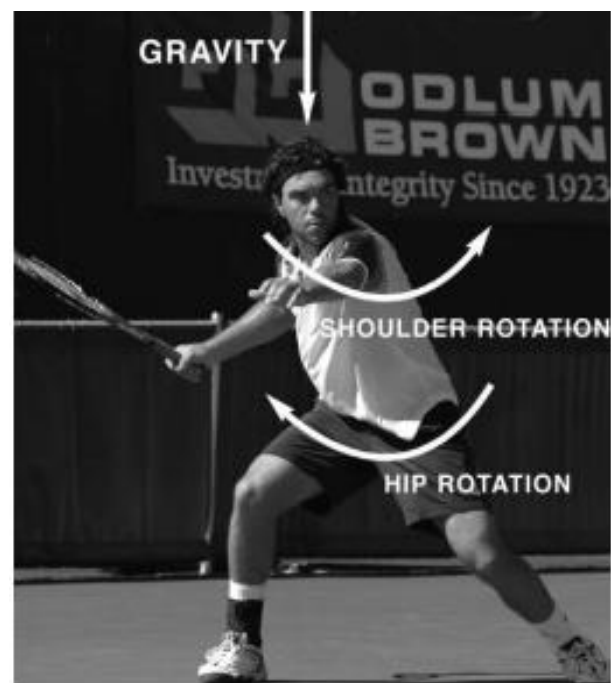


Figure 1. Gravity rotation- Player Paul Baccanello - Photo Courtesy Jan Benjamin Photography.

seconds (Morante & Brotherhood 2005; O'Donoghue & Ingram 2001; Smekal et al, 2001). It is common for players to perform more than 500 directional changes during a single match or practice (Roetart & Kovacs, 2011), with more than

70% of movements being side-to-side, less than 20% a forward linear direction and less than 8% of movements in a backward linear direction (Weber et al, 2007). Individuals designing training programs for tennis players must keep these time frames, directions of movement and additional needs in mind when designing programs for the different physical components (Petersen & Nittinger 2013).

WHAT DOES MALALIGNMENT FEEL LIKE?

Does the player’s body ever seem like it is crooked or twisted? Do they feel as though one foot is scuffing the ground more than the other foot? If feelings such as these are accompanied by pain or stiffness in the lower back, groin, or into the buttocks and down the kinetic chain, this could be due to malalignment syndrome. Although there are many areas of abnormal biomechanics, a common one - namely, malalignment of the pelvis, spine, and extremities - is often overlooked.

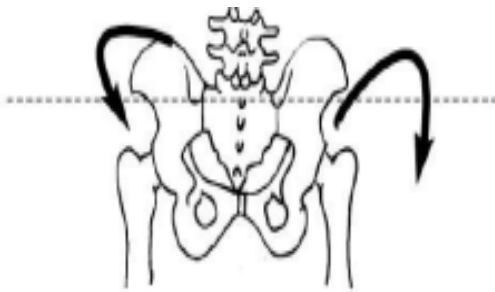


Figure 2: Diagram of the pelvis.

Clinically malalignment syndrome is characterized by the following features

- Distortion of the pelvic ring
- Associated changes in the alignment of the axial and appendicular skeleton, so there appears to be a reorientation of the body from head to foot
- Compensatory changes in the soft tissue structures
- Occasionally, also visceral involvement, affecting the genitourinary, gastrointestinal and reproductive systems.

Table 1: Clinical features of malalignment syndrome (adapted from Schamberger, 2002 & 2013).

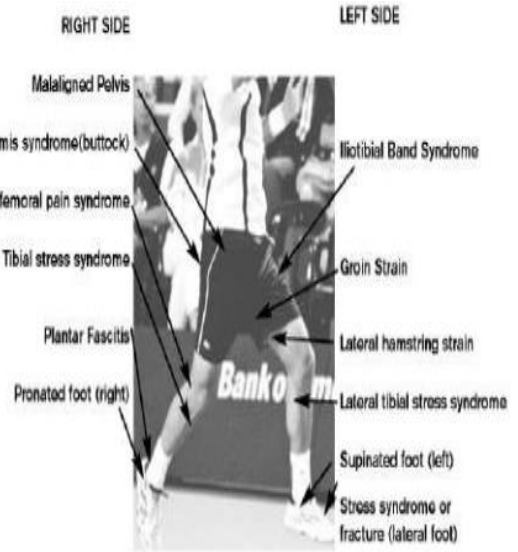


Figure 3. 3 common malalignment injuries.

COMMON RISK FACTORS FOR MALALIGNMENT (ADAPTED FROM PETERSEN & SCHAMBERGER, 2013):

- Playing asymmetrical sports that require a lunging and/or rotation action such as tennis and other swinging racquet sports such as golf, baseball, hockey or cricket
- Repeatedly landing from a jump with one leg first
- Training on a camber (sloped surface, like the side of the road)
- Inadequate inner core unit stability
- Inadequate muscle sling control, strength and endurance
- Inadequate hip flexibility, especially hip flexors
- Driving for long distances (reaching for the gas pedal)

The complete ‘malalignment syndrome’ is normally seen in association with two presentations of pelvic malalignment, namely ‘rotational malalignment’ and ‘upslip’. Rotational malalignment is by far the most common, occurring in 80-85% of those with pelvic malalignment; an upslip occurs in isolation in about 5-10%, and the combination of an upslip with a rotational malalignment in another 5-10% (Schamberger, 2002, 2013). There are simple alignment checks that the players and coaches can do to help decide if they are rotationally malaligned. These are effective tools to help find the root of the problem but are not meant to be looked at in isolation and should be dealt with by an appropriately trained physiotherapist.

Quick Functional Test -Repeated Single Leg ¼ Squat (adapted after Petersen, 2006)

Purpose: To identify the presence of dysfunction in the dynamic stability and balance of the lower core and legs.

- Stand on one leg on flat ground or a step, keep heel flat
- Raise opposite leg up so knee is at 90 degrees and keep foot dorsiflexed
- Raise arms out in front to horizontal and clasp hands together
- Keep eyes facing straight forward and shoulders square and do a single leg squat (to 30-40 degrees) up and down three consecutive times, then repeat this routine on the opposite leg



Figure 4. Repeated single leg 1/4 squat.

Pass Criteria:

You can complete the motion without the presence of pain, abnormal tracking and movement, unusual stiffness or tension.

- No Trendelenburg on stance leg (dipping of the hip on the opposite to stance leg)
- Ability to keep knees tracking over the toes
- Ankle stays stable
- Front foot stays flat on ground
- Hip does not thrust forward
- Low back does not hyperextend

Fail: You are NOT able to complete the motion and hold the position without the presence of pain, abnormal tracking and movement, unusual stiffness or tension.

RECOGNIZING MALALIGNMENT USING ANATOMICAL LANDMARKS

Quick leg length check: supine lying

Have the player lie on their back, then bend both knees - keeping feet flat on the surface - and lift buttocks off the surface. Now pull both legs out straight. Check functional leg length at the medial malleolus. It is best to take a bird's eye view from above to see if the malleoli line up. With the most common presentation (right anterior, left posterior torsional displacement) the right leg will most often look longer than the left.



Figure 5. Leg-length check supine lying.

Quick pelvic bone check: supine lying

Place one finger on each of the bony protuberances known as the anterior superior iliac spine (ASIS). Make sure to landmark on the same point of each side. Look from directly above and decide if the ASISs are aligned in relation to each other or if one appears to be displaced upward or more forward than the other. Most commonly, with a 'right innominate anterior, left posterior' rotational displacement, the right ASIS will appear displaced downward and forward relative to the left; the pubic bones will be similarly displaced relative to each other at the symphysis pubis.



Figure 6. Pelvic bone ASIS check supine lying.

RULES FOR MAINTAINING ALIGNMENT:

Rule 1. Re-Alignment Routine (6 x 6 corrective exercises)

Rule 2. Regain and Maintain Muscle Length

Rule 3. Release the Soft Tissue

Rule 4. Re-Connect the Core

Rule 1. Re-alignment routine (6 x 6 corrective exercises)

Once a rotational malalignment has been identified and corrected the players can effectively maintain it in neutral with the following simple 6 x 6 home program carried out when the player feels out of alignment after playing, training and travelling. Do the following simple muscle energy technique as demonstrated on the right and left side holding for 6 seconds and repeating 6 times using approximately 30% power.



Figure 7. Corrective exercises right.



Figure 8. Corrective exercises left.

Rule 2. Regain and maintain muscle length

Simple symmetrical stretches for the low back and hips will help keep the player properly aligned. The state of tension in muscle groups should be assessed daily and new stretches added to ensure that a good length-tension balance is maintained in all muscle groups. Static stretches prior to

exercise did not prevent lower extremity overuse injuries, but additional static stretches after training and before bed resulted in 50% fewer injuries occurring (Hartig & Henderson, 1999). Static stretches should be held for 30 seconds to the point of tension -NOT pain- and repeated 3 times.



Figure 9. Paraspinal stretch.



Figure 10. Gluteal stretch.



Figure 11: hip flexor stretch.

Rule 3. Release the soft tissue

If an area is especially tight or sensitive, use the ball as a trigger point release tool and stay on the sore spot for up to two minutes or more (Petersen & Sirdevan, 2006). Post-training soft tissue release is often better than just advice and is a positive step towards relieving symptoms of trigger points, delayed onset muscle soreness and muscle tension



Figure 12: ball release quadriceps.



Figure 13: ball release gluteals.



Figure 14: ball release adductors.

Rule 4. Re-Connect the Core

All athletes need a strong core to maintain balance, stability and alignment as they generate power. The abdominal musculature plays a significant role in trunk and core stability providing a mechanical link between the lower and upper limbs (Maquirrian et al, 2007). When moving in multi-planar

directions, the core muscles and hip stabilizers work functionally to control movement. Upper and lower core strength provides a stable 3-dimensional power platform for the extremities to work off during multi-planar, joint and muscle activities that involve acceleration and deceleration forces (Petersen, 2005). Research has demonstrated that lower extremity position influences scapular muscle recruitment and muscle balance ratios in closed kinetic chain exercises (Maenhout et al, 2010) and in open kinetic chain exercises (De Mey et al, 2012). Therefore, reconnecting the core with simple exercises that either close or partially close the kinetic chain for both upper and lower extremities helps increase the core stability and ensure optimal recruitment, timing, performance and injury prevention.



Figure 15a and 15b. Quadruped bridge (top) to arm & leg raises (bottom).

Training Tip:

- **Reps: 5-10, Sets: 1-3, Tempo: 1-1-1 or 1-2-1**

- Start in a quadruped bridge position on hands & knees
- Switch on your core muscles
- Now raise up either one arm, one leg or opposite arm & legs & hold for 2-4 seconds
- Repeat on opposite side
- Do 2-3 sets of 5-10-15 repetitions on each side



Figure 16a and 16b. Split squat & shoulder diagonal pull - start (left) and end (right).

Training Tip:

- Start in a split squat position in front of a physio ball with right lower leg on ball
- Hold a stretch band in right hand with the other end firmly anchored
- Switch on your core muscles
- Do a split squat down pulling stretch band up into a diagonal pattern
- Do 2-3 sets of 10-15 repetitions on both sides.



Figure 17a and 17b. Posterior oblique sling drill.

Training Tips:

- Stand facing a wall holding two ends of a stretch band against a wall & a light stretch band around ankles
- Switch on your core muscles
- Do a shoulder retraction with one arm while doing a hip extension on the opposite side
- Do 2-3 sets of 10-15 repetitions on both sides.



Figure 18a and 18b. Anterior oblique sling drill-dynamic hip hike.

Training Tips:

- Start in a split squat position with a physio ball at your back
- Switch on your core muscles
- Drive back knee up to opposite elbow & back down slowly to start position
- Do 2 -3 sets 10-15 repetitions on both sides.

CONCLUSION

Our intention with this article was to create an awareness of the malalignment syndrome and the type of problems these can create for tennis players. If there is inadequate development of the stable platforms of the upper core and arms and lower core and legs, the athletes may be at risk of injury (Petersen & Nittinger, 2013). Over time players can learn to recognize the subtle changes that may occur upon recurrence of malalignment, such as a change in walking or running gait, changes in ease of multi-directional movement, or abnormal tension in the tissues. Early recognition of malalignment allows for earlier treatment, correction, and ideally an avoidance of the discomfort and associated problems. Malalignment puts athletes at increased risk of injury and once injured they are likely to take longer to recover, or may even fail to do so at all (Schamberger 2002; 2013). Players who are not able to maintain alignment will have difficulty progressing in the technical and physical training aspects and may have to decrease volume and intensity of training and playing. In some extreme cases they may have to abandon the sport altogether.

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