Uncommon abdominal muscle injury in a tennis player: internal oblique strain

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CASE REPORT

Uncommon abdominal muscle injury in a tennis player: internal oblique strain

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The case of a strain injury of the internal oblique abdominal muscle in a professional tennis player is presented. This uncommon lesion resulted from eccentric, unbalanced trunk rotation. Magnetic resonance imaging helped to confirm the diagnosis. Tennis specific core strengthening is crucial for rehabilitation and recurrence prevention.

Muscles of the anterolateral abdominal wall comprise three thin broad aponeurotic layers, namely the external oblique, the internal oblique, and the transverse muscles.[1 2] On either side of the midline there is also a wide vertical muscle, the rectus abdominis. The internal oblique muscles lie under and are hence protected by the external oblique, with fibres from each running perpendicular to one another.[3] The internal oblique originates from the lumbar fascia, the anterior portion of the iliac crest, and the inguinal ligament. It inserts superiorly on the 9th, 10th, 11th, and 12th costal cartilages, along the linea alba, and is continuous with the internal intercostal muscles.[1 2] The internal oblique muscles are the flexor and ipsilateral axial rotator. They derive their nerve supply from the six lower thoracic and the first lumbar nerves.[1 2]

Rectus abdominis injuries are common in tennis players at all levels of competition.[4 5] Most lesions affect the non-dominant muscle, and the tennis movement primarily involved in the injury mechanism is usually the serve.[4–6] In contrast, lateral abdominal muscles are rarely injured, and there is little information about this lesion in sports medicine literature. Internal oblique injuries have been reported as part of ''side strain syndrome'' in only a few sports activities such as cricket, ice hockey, and hurdles.[3 7–9] To the best of our knowledge, there is no description of internal oblique injury in tennis players.

The purpose of this report is to describe a case of acute strain of the internal oblique abdominal muscle in a professional tennis player.

CASE REPORT

A 22 year old, right handed professional tennis player presented with acute pain along the left anterolateral abdominal wall during a practice session. He complained of sudden pain after uncoordinated twisting while executing a one handed backhand. On immediate examination by the first author, he presented mild discomfort, tenderness close to the anterior rim of the 11th and 12th ribs, pain on the contraction against resistance manoeuvre, on stretching the left lateral abdominal wall, and also during deep inspiration. Radiographic evaluation was normal, and magnetic resonance imaging (MRI) on the same day showed increased focal intensity in the proximal portion of the lateral abdominal wall middle layer (fig 1). Diagnosis of left internal oblique muscle strain injury (grade 1) was established, and the player was advised to avoid practice. Initial treatment consisted of rest, girdle compression, cryotherapy, oral non-steroidal anti-inflammatory drugs, and physiotherapy. On day 5, isometric strengthening was indicated; on day 12 concentric strengthening exercises were begun, together with light stretching as well as aerobic conditioning. The final stage of rehabilitation emphasised eccentric exercises, core strengthening, and plyometrics. The patient returned to high level competition after four weeks and did not report recurrence in the following 18 months.

DISCUSSION

Side strain injuries in athletes are rarely a diagnostic dilemma for clinicians. Clinical features are conclusive; however, radiographs should be obtained to rule out bone involvement such as rib fractures[4] or iliac crest avulsion in athletes with unfinished skeletal growth. MRI can be used to accurately identify anatomical site and degree of injury, as well as to rule out additional lesions such as osteochondral rib damage. Given the different properties and actions of the overlying anterolateral abdominal muscles, a knowledge of which muscle is injured may help to guide individual patient rehabilitation.

Interesting clinical information may be obtained from anatomical and biomechanical considerations regarding the oblique muscle. The internal and external obliques are examples of muscles that do not follow a straight line trajectory between origin and insertion, but wrap around the torso.[10] This elliptical course offers mechanical advantage, especially during axial rotation when the torso is flexed, extended, or twisted.[10] An anatomical link has been demonstrated between the shoulder girdle and the abdominal musculature.[11] Because of their location, the obliques can be considered multiarticular muscles and, as they connect the torso to the pelvis, they are particularly active during sports activities.

Dynamic electromyographic recordings of abdominal muscle activity during tennis strokes have not been registered, but are expected to be similar to those calculated for batting in baseball.[12] Such rotational athletic movements represent sequential coordinated muscle activity, beginning at the hip, continuing in the trunk, and finishing in the upper limb. Abdominal oblique muscles have shown greater than 100% maximum activity on manual testing during the swing and follow through phases.[12] Intense sustained activity in muscles located in the trunk indicates the importance of stabilising the back and abdomen during these strokes.[12] During follow through of a backhand groundstroke, the trunk decelerates. Strong participation of the abdominal oblique muscles during this stage suggests a key role in trunk deceleration after ball impact.

In recent years many training programmes have realised the importance of strengthening trunk and pelvis muscles (''core stability''). The former help to transfer energy from the legs through the core to the upper body and arms. This is

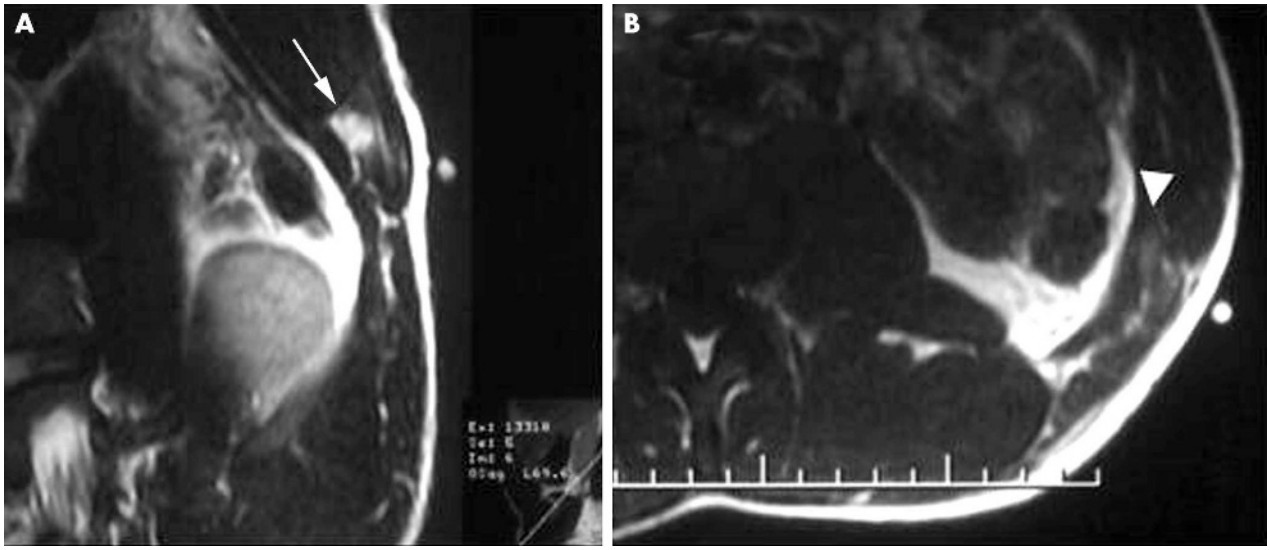

Figure 1 (A) T2 weighted axial oblique magnetic resonance image of left abdominal wall in a professional tennis player. There is focal abnormal signal intensity in the upper portion of the internal oblique muscle (arrow) compatible with strain. The hyper-intensity area in the surrounding soft tissue represents perifascial oedema. (B) T1 weighted axial image of the same patient showing high signal intensity at the tear site indicating the presence of blood, which characterises the acute phase of muscular strain (arrowhead). Surface marker has been placed over the region of clinical concern.

What is already known on this topic

- Lateral abdominal muscles are rarely injured in sports; internal oblique injuries have been reported as ''side strain syndrome'' in only a few sports activities
- Internal oblique muscles have shown high activity during the swing and follow through phases of rotational athletic movements

What this study adds

- The internal oblique muscles can be injured during the eccentric phase of tennis rotational trunk movements
- Identifying the injury site and severity by MRI may help the physician to guide the rehabilitation process, and tennis specific core strengthening exercises may be useful to enhance performance and reduce the high rate of recurrence associated with internal oblique injuries

especially important in rotational or asymmetric sports such as tennis.[13] Core training for athletes should be specifically adapted to the sports skills required. In the present case, before returning to competition the player performed specific ''medicine ball'' exercises trying to reproduce the kinetic chain of tennis groundstrokes. Introduction of this type of exercise into tennis training programmes may be useful to minimise the high rate of recurrence that has been associated with internal oblique injuries.[7]

In summary, strain injuries of internal oblique abdominal muscles are uncommon in the athletic population. They are often the result of extreme, unbalanced, eccentric muscle contraction. In sports involving heavy trunk rotational motions such as tennis, special training emphasis should be placed on trunk and hip strengthening to prevent recurrence and enhance performance.

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