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Rotator cuff injuries in medico-legal practice

AETIOLOGY

Rotator cuff tears are a common cause of shoulder weakness and pain.[1] Rotator cuff tears have been found in 36%[2] of people with shoulder pain. One of the major difficulties from a medico-legal perspective is how to differentiate reliably between constitutional (degenerative) tears and work-related injuries or traumatic tears. Rotator cuff tears may be caused by extrinsic or intrinsic factors. Tears may be a result of exclusively extrinsic, exclusively intrinsic or a mixture of both factors. A tear resulting from extrinsic factors may be a result of a single traumatic event or degeneration and cuff failure due to a repetitive act, a 'cumulative trauma disorder'. A tear due to exclusively intrinsic factors is a result of tendon degeneration as part of the ageing process with no associated mechanical cause. The crucial question when considering the issue of causation for a painful tendon tear is whether the pathology has a mechanical cause or is due to the normal ageing process. There still remains considerable range and difference of opinion among orthopaedic surgeons about surgical indications for cuff tears[3] and there is much ongoing work looking at the clinical and cost effectiveness of rotator cuff repair.[4]

EXTRINSIC CAUSES

Young adults typically have normal rotator cuff tendons. A single traumatic event causing a rotator cuff tear in an individual with normal tendons may include mechanisms such as a sporting injury, a significant fall or a road traffic collision. Acute rotator cuff tears generally occur in previously asymptomatic patients, who identify a significant traumatic incident leading to a sudden onset of symptoms including severe pain, immediate loss of strength and functional impairment of the shoulder. Acute rotator cuff tears only account for 8% of patients who present with symptomatic rotator cuffs.[5] Correct and early clinical diagnosis is often difficult.[6] Tears associated with degeneration occurring in connection with a repetitive task were described by Neer.[7] The process begins with oedema and haemorrhage, followed by fibrosis, tendonitis and finally a tear of the rotator cuff tendon. Neer suggested that this degeneration resulted from mechanical impingement due to unfavourable bony anatomy of the shoulder and repetitive heavy overhead activity.[7] In this type of degenerate tendon, as the pathology progresses, pain increases. At first the patient often reports pain not during the repetitive task but in the evening, after a day's work. Pain may gradually increase but often the individual recalls a trivial injury or unusual exertion associated with a seemingly disproportionate increase in level of pain. Rotator cuff tears are a major cause of work-related shoulder pain. A meta-analysis of work activity and shoulder pain has identified occupational risk factors consistently associated with shoulder pain, including heavy load, awkward postures, working with forward flexed trunk, working with arms above shoulder level, repetitive movements, performing the same activity for a prolonged period, e.g. typing or driving, vibration and length of employment.[8] Psychosocial factors such as mental stress and job pressure were also found to have associations with shoulder pain.[9]

INTRINSIC TENDON DEGENERATION

Cuff tears are also more common with increasing age in the general population including, notably, those with no shoulder pain (Table I). Such age-related tendon degeneration and resulting rotator cuff tears are also present in those with no history of trauma. In the population studied by Fukuda et al,[10] 53% of patients with partial-thickness tears and 35% of those with a full-thickness tear did not recall any episode of injury. Rotator cuff degeneration and tears, therefore, may be considered part of the normal ageing/degeneration process in some individuals. A reduction in blood supply to the rotator cuff with age, as seen on ultrasound by Rudzki et al,[11] is proposed as one of the causes of degeneration, as are other intrinsic structural changes. This may explain pathology in those without a mechanical cause and those experiencing a tear with no, or only minimal, trauma. Age-related rotator cuff degeneration is not inevitable for everyone and not all workers are susceptible to rotator cuff pathology as a result of performing repetitive tasks. The existence of an intrinsic predisposition to shoulder pain is supported by the finding that younger workers performing manual repetitive jobs are more affected by length of time in employment but not older workers, implying that only those without a predisposition to shoulder pain are able to continue in such a role.[9] Higher rates of ultrasound-detected cuff tears are found in the asymptomatic siblings of individuals with symptomatic tears, adding further evidence for an inherited predisposition.[12]

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Table I. Prevalence of rotator cuff tears by age.

Age	Prevalence of rotator cuff tear, detected by ultrasound or MRI (%)			
	General population; those with and without shoulder pain[2]	General population; those without shoulder pain[20]	General population; those with and without shoulder pain[21]	Population without shoulder pain[22]
20 to 29	0	} 0	0	-
30 to 39	2.5		-	-
40 to 49	6.7	} 4	-	-
50 to 59	12.8		10.7	13
60 to 69	25.6		45.2	20
70 to 79	45.6	} 28	26.5	31
80 to 89	50		36.6	51

ATTRIBUTING A CUFF TEAR TO A PARTICULAR INJURY

If a rotator cuff tear is found following an episode of significant trauma to a previously normal shoulder it can be concluded that the injurious event caused that tear. In the presence of age-related tendon degeneration and tears, the pre-existing state of the tendon and its susceptibility to tearing must, however, be considered. The incidence of rotator cuff tears increases with age in those who have suffered an acute shoulder injury.[6] An extrapolation of this finding is that rotator cuff degeneration with increasing age results in increased susceptibility to tearing, and tears are caused by a less severe mechanism of injury. As well as the severity of trauma, the probability that the shoulder was normal prior to a traumatic event is key when judging the likelihood that a particular injury alone resulted in a rotator cuff tear. The observed frequency of cuff tears in the general population provides some guidance in predicting the likelihood of a pre-existing rotator cuff tear.

As well as predicting likelihood of a pre-existing tear, other factors must also be considered when judging the degree to which an injury or repetitive act resulted in a tear for an individual.

A medical history of confirmed pre-existing rotator cuff tear is highly significant. A cuff tear detected on diagnostic scanning following the injury in question may be a historic tear. For clarification, contemporary and historic diagnostic imaging may be compared. Both MRI and ultrasound are widely used diagnostic imaging techniques for soft-tissue shoulder pathology. Comparison between diagnostic tests when judging whether there is an additional tear, or extension of an existing tear, is usually possible with MRI but less reliable if ultrasound has been used due to the dynamic and operator-dependent nature of ultrasound. It has been noted that degenerative rotator cuff tears have a significant tendency to increase in size with time,[13] so caution must be exercised when attributing an increase in tear size to a particular injury. A diagnostic scan performed acutely may identify signs of an acute tear, such as associated haematoma, which may not be detectable at a later stage even if symptoms persist. In the UK, patients with a painful shoulder following an injury are typically assessed in an emergency department and orthopaedic fracture clinic or by their general practitioner. For a clinically diagnosed rotator cuff tear, initial treatment consists of analgesia and rest followed by physiotherapy with possible injection of local anaesthetic and steroid to the shoulder. Acute traumatic tears are often treated surgically. Even if one assumes that a tear is due to the injury in question, a previous history of cuff tear may still be relevant as it provides evidence that an individual is at a higher risk of cuff tear due to intrinsic degeneration. Other factors would have to be considered in this situation such as the age of the individual and the severity of the injury mechanism of the previous tear, together with the mechanism of injury claimed for the current tear. It may be suggested, depending upon the nature of the trauma involved, that it has brought forward the onset of impingement or rotator cuff tear by a certain period of time. This does of course introduce the dangerous and somewhat imprecise concept of advancement or acceleration of symptoms. This is not a concept that has any value for us in clinical practice but sometimes needs to be considered in medico-legal practice in order to help the solicitors/insurers put a value on the claim when neither the total causation nor nil causation position appear to fit the particular scenario under consideration.

LONG-TERM MORBIDITY

There is significant inconsistency in the relationship between shoulder pain and the presence of a rotator cuff tear. It remains unclear why some tears are painful and others not. An initially asymptomatic tear may become painful, particularly after even a minor injury. It has been suggested that the degree of pain has more association with degree of bursitis than tear size.[6] Yamaguchi et al[13] found that 51% of those with an initially asymptomatic tear developed pain at a mean of 2.8 years later. This may give some indication of the timeframe in which patients may have developed symptoms in any case without any further trauma. Conversely, in the presence of a past medical history of an asymptomatic tear, an injury or series of injuries which results in ongoing symptoms from that point may be considered to have brought the symptoms forward by 2.8 years in 51% of patients. The intuitive position that pain increases with size of tear remains uncertain.[14,15] Approximately 75% of those who sustain a rotator cuff tear can have a good outcome in terms of function and pain with non-operative treatment.[16,17] For those who require operative intervention, outcomes are favourable in 77% to 89%, regardless of age, although outcomes for females are slightly poorer than for males.[18] Those who have undergone surgery who experience re-rupture of the rotator cuff also seem to have long-term favourable outcomes.[19]

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