



Movement and pain patterns in early stage primary/idiopathic adhesive capsulitis: a factor analysis

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Abstract

Objectives To evaluate patients clinically diagnosed with early stage primary/idiopathic adhesive capsulitis to determine the existence of any pattern of movement loss and associated pain that may facilitate early recognition.

Design Cross-sectional study.

Setting Private upper limb specialty clinic, Newcastle, Australia.

Participants Fifty-two patients clinically diagnosed with early stage adhesive capsulitis by a medical practitioner or physiotherapist.

Main outcome measures Percentage loss of active and passive ranges of eight shoulder movements and the pain level at the end of each movement. The reason for limitation of movement was also recorded.

Results Factor analysis clearly identified two groups for percentage loss of active range of movement. Notably external rotation movements grouped separately from other movements. A single group emerged for percentage loss of passive range of movement suggesting a non-specific global loss. For both pain at the end of active range of movement and passive range of movement two groups emerged, however the delineation between the groups was less clear than for percentage loss of active range of movement suggesting a pattern of end range pain may be less useful in identifying patients in this stage.

Conclusions External rotation movements in neutral and abduction generally group together and behave differently to other shoulder movements in patients clinically diagnosed with early stage primary/idiopathic adhesive capsulitis. In particular external rotation in abduction has emerged as the most painfully limited movement in this sample. This study provides preliminary evidence of patterns of range of movement and end range pain that require testing in a population of mixed shoulder diagnoses to determine their diagnostic utility for early stage adhesive capsulitis.

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Keywords: Shoulder patterns; Shoulder pain; Adhesive capsulitis; Range of motion; Factor analysis

Introduction

Adhesive capsulitis is a shoulder disorder that is recognised as consisting of three stages and reported to last from one to three years [1]. The disorder is described as either primary or idiopathic when the onset is insidious, and secondary when a known event precedes the onset [2]. Adhesive

capsulitis has a number of reported associations that include, but are not limited to, diabetes [3], Dupuytren's disease [4] and thyroid dysfunction [5], as well as a reported higher incidence in females [6]. The first or early stage is generally agreed to last up to nine months [7] and is typically characterised by pain rather than marked loss of movement [2]. Whilst adhesive capsulitis is usually recognisable in the later stages due to distinct restriction of both active and passive ranges of movement [8], it is considered difficult to identify and differentiate from other shoulder disorders in its early stage [9].

Routine assessment of patients with musculoskeletal disorders generally includes measurement of both active and

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passive ranges of movement, as well as any pain associated with each movement. Patterns of movement deficit and the behaviour of pain often assist in diagnosis [10]. As a means of differentiating joint capsular pathology from other causes of symptoms, James Cyriax described what is called the ‘capsular pattern’ [11]. This capsular pattern suggests a fixed proportion of movement loss is present and that each joint has a characteristic pattern [11]. The pattern for the glenohumeral joint proposed by Cyriax is that the proportional passive loss of external rotation will be greater than the proportional loss of abduction, which will be greater than the proportional loss of internal rotation. Although the literature on adhesive capsulitis frequently acknowledges this ‘capsular pattern’ [1,12], recent studies have demonstrated that it may not be consistently present [13–15]. Notably, however, these studies have involved populations in the latter stages of the disorder. No studies have examined the presence of the ‘capsular pattern’, nor any other recognisable pattern of movement loss in the early stage of adhesive capsulitis.

Recent research into the pathology of adhesive capsulitis has identified that initial inflammation of the glenohumeral joint capsule is followed by fibrosis and contracture [16]. This understanding of the pathology provides an explanation for the temporal behaviour of the symptoms, which are reported to initially manifest with pain followed by subsequent progressive movement restriction [17]. Surgical and radiological investigations have identified that anterior structures of the glenohumeral joint are predominantly affected [18,19], which may help explain the observed pattern of movement loss or pain reported in adhesive capsulitis, notably in external rotation [20]. However, the contribution of other active and passive shoulder movements to diagnosis have not been similarly considered.

As well as the lack of investigation of any pattern of either active or passive movement loss in early stage adhesive capsulitis, any associated pain pattern has also not been described to date. As pain is reported to be a key component of the early stage, it would therefore be potentially valuable to evaluate any contribution it may make to the clinical presentation of this disorder.

It has been suggested that treatment in the early stage of adhesive capsulitis may reduce the overall morbidity of the disorder [17]. The mixed results of treatment reported however, have been suggested to be at least partially as a result of the inability to define or classify sub-groups of patients likely to respond to physiotherapy and other interventions [21]. Although a set of clinical identifiers that may assist diagnosis in the early stage have been proposed, including global loss of active and passive ranges of movement and pain at the end-range in all directions, they have yet to be validated [22]. The recognition of any pattern of movement restriction or pain that may assist early diagnosis or identify sub-groups of patients would therefore be valuable. The overall aim of this study was to evaluate patients with a clinical diagnosis of early stage adhesive capsulitis to determine if it was possible to identify a pattern of movement loss and/or associated end

range pain that may facilitate recognition of this diagnostically challenging stage of the disorder. The findings of this preliminary study will enable future studies of mixed diagnosis populations to determine whether any patterns that may emerge are unique to the early stage of primary/idiopathic adhesive capsulitis.

Materials and methods

Participants

Fifty-two participants attending an upper limb specialty clinic diagnosed with early stage adhesive capsulitis on the basis of clinical presentation by various health care practitioners, including orthopaedic surgeons, a shoulder physician, general practitioners and physiotherapists were included in the study. In the absence of any validated criteria for the diagnosis of early stage primary/idiopathic adhesive capsulitis the clinical decision of the referring practitioner was considered pragmatically appropriate. Participants were required to have had symptoms for less than nine months, consistent with the reported duration of the early stage of the disorder [7]. As primary/idiopathic adhesive capsulitis was being investigated, patients with a history of major trauma or surgery of the shoulder were excluded. Potential participants were also required to have had recent shoulder X-rays and ultrasound examinations which did not demonstrate potential alternate diagnoses. Further exclusion criteria included a diagnosis of any systemic inflammatory joint disease, as well as neurological or current cervical spine disorders. Glenohumeral joint injection in the preceding six weeks was also an exclusion criterion.

Procedure

Each participant underwent routine clinical examination including measurement of active and passive shoulder ranges of movement. These included total shoulder flexion (TSF) and abduction (TSA), glenohumeral joint flexion (GHF) and abduction (GHA), and external rotation in neutral (ERN), together with external and internal rotation in 90° abduction (ERA and IRA respectively). Hand behind back (HBB) range was also measured. Measurement was performed by one of the researchers, an experienced musculoskeletal physiotherapist, using a Baseline digital inclinometer (Fabrication Enterprises Incorporated, Irvington, NY, USA) for all movements with the exception of HBB which was measured with a tape measure. Digital inclinometry has been demonstrated to have a measurement error of $\pm 1^\circ$ [23]. The range of movement was recorded in degrees for all movements other than HBB which was recorded in millimetres.

Measurement of shoulder ranges of movement was based on the method described by Green *et al.* [24]. The following movements were performed in sitting: TSF, GHF, TSA, and GHA. The starting position for these movements was with

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