



Original Article

Profile of collagen gene expression in the glenohumeral capsule of patients with traumatic anterior instability of the shoulder^{☆,☆☆}



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ABSTRACT

Objective: To evaluate the expression of the genes COL1A1, COL1A2, COL3A1 and COL5A1 in the glenohumeral capsule of patients with traumatic anterior instability of the shoulder.

Methods: Samples from the glenohumeral capsule of 18 patients with traumatic anterior instability of the shoulder were evaluated. Male patients with a positive grip test and a Bankart lesion seen on magnetic resonance imaging were included. All the patients had suffered more than one episode of shoulder dislocation. Samples were collected from the injured glenohumeral capsule (anteroinferior region) and from the macroscopically unaffected region (anterosuperior region) of each patient. The expression of collagen genes was evaluated using the polymerase chain reaction after reverse transcription with quantitative analysis (qRT-PCR).

Results: The expression of COL1A1, COL1A2 and COL3A1 did not differ between the two regions of the shoulder capsule. However, it was observed that the expression of COL5A1 was significantly lower in the anteroinferior region than in the anterosuperior region (median \pm interquartile range: 0.057 ± 0.052 vs. 0.155 ± 0.398 ; $p = 0.028$) of the glenohumeral capsule.

Conclusion: The affected region of the glenohumeral capsule in patients with shoulder instability presented reduced expression of COL5A1.

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Perfil de expressão de genes do colágeno na cápsula glenoumeral de pacientes com instabilidade traumática anterior do ombro

R E S U M O

Palavras-chave:

Instabilidade do ombro
Cápsula articular
Expressão gênica
Matriz extracelular
Colágeno

Objetivo: Avaliar a expressão dos genes COL1A1, COL1A2, COL3A1 e COL5A1 na cápsula glenoumeral de pacientes com instabilidade anterior traumática do ombro.

Métodos: Foram avaliadas amostras de cápsula glenoumeral de 18 pacientes com instabilidade anterior traumática do ombro. Foram incluídos pacientes masculinos, com teste de apreensão positivo e lesão de Bankart no exame de ressonância magnética. Todos os pacientes sofreram mais de um episódio de luxação do ombro. Foram coletadas amostras da cápsula glenoumeral lesionada (região anteroinferior) e da região macroscopicamente não afetada (região anterossuperior) de cada paciente. A expressão dos genes de colágeno foi avaliada por reação em cadeia da polimerase após transcrição reversa com análise quantitativa (qRT-PCR).

Resultados: A expressão de COL1A1, COL1A2 e COL3A1 não diferiu entre as duas regiões da cápsula do ombro. No entanto, foi observado que a expressão de COL5A1 estava significativamente reduzida na região anteroinferior em relação à região anterossuperior (mediana \pm intervalo interquartilico: $0,057 \pm 0,052$ vs $0,155 \pm 0,398$; $p=0,028$) da cápsula glenoumeral.

Conclusão: A região afetada da cápsula glenoumeral de pacientes com instabilidade do ombro apresentou uma expressão reduzida de COL5A1.

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Introduction

The great range of motion provided by the scapular belt allows the glenohumeral joint to be used as a stable fulcrum for placing the extremities of the upper limbs in a variety of spatial positions. However, one consequence of this great range of motion is that this joint has a propensity to become unstable.¹

It is believed that the shoulder is the joint of the human body that most frequently suffers dislocation, with an incidence of 8.2–23.9 cases per 100,000 individuals per year.^{2,3} Among these cases, 95% are caused by traumatic events and lesions of the anterior capsule are involved in 90% of these individuals.^{4,5} Episodes of shoulder dislocation occur most frequently in young male individuals.⁶ Many of the individuals affected practice competitive sports.⁷ The recurrence rate for shoulder dislocation is high and reaches up to 100% among young athletes.^{8,9}

The anteroinferior (AI) region of the glenohumeral capsule is the location most affected in episodes of traumatic shoulder dislocation.¹⁰ After the first episode of anterior shoulder dislocation, it is common for patients to present shoulder instability.^{8,9} Patients with shoulder instability generally present plastic deformation of the capsule, which may result in capsule laxity.^{10,11} Previous studies have demonstrated that plastic deformation of the capsule is necessary even in the first dislocation.^{12–14} Currently, little is known about the structure of the capsule, especially among patients with shoulder instability. Better comprehension of the underlying biology is important for guiding patient management and for developing new therapeutic options that are complementary to surgery.

The capsule is composed of cellular and fibrous elements. The collagen content of the capsule progressively increases during embryonic development and at birth this tissue is generally fibrous.¹⁵ Types I, III and V fibrillar collagen are the commonest types in the shoulder capsule.¹⁶ Mutations in the genes that code for these collagens have been identified in most of the forms of Ehlers–Danlos syndrome (EDS) and imperfect osteogenesis,^{17,18} which present frequent dislocations in several joints, including the shoulder joint. Thus, alterations to these genes may also play a role in shoulder instability.

The aim of the present study was to compare the messenger RNA (mRNA) expression of COL1A1, COL1A2, COL3A1 and COL5A1 between an injured region and another, uninjured region of the glenohumeral capsule in patients with traumatic anterior shoulder instability.

Materials and methods

Patients

Samples were collected from the glenohumeral capsule of 18 patients with traumatic anterior shoulder instability who underwent arthroscopic surgical treatment at Hospital São Paulo, Federal University of São Paulo (UNIFESP), between June 2011 and June 2013. During joint propaedeutics, any presence of associated lesions was noted. All the patients were seen to present capsule redundancy in the anteroinferior region. A free and informed consent statement was obtained from all the patients, as approved by UNIFESP's ethics committee (procedural number: 1085/11). The patients' mean age at the time of the surgery was 30 years (range: 18–42). Their mean

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