 https://doi.org/10.21751/FRM-40-1-1

FUNKCIONALNA ANATOMIJA RAMENA

Anđela Grgić, Mila Čaušić, Mirela Logara-Pavličić, Barbara Sabrine Samardžija, Mihaela Šolić

Zavod za fizikalnu medicinu i rehabilitaciju, Klinički bolnički centar Osijek, Osijek, Hrvatska
Medicinski fakultet Osijek, Sveučilište J. J. Strossmayera u Osijeku, Hrvatska
e-mail: grgic.angel@gmail.com

Rame predstavlja vrlo pokretljiv, no nestabilan kompleks, u kojem koordinirana interakcija više zglobova i stabilizatora mekog tkiva omogućuje preciznu funkciju gornjih udova. Rame se sastoji od glenohumeralnog, akromioklavikularnog i sternoklavikularnog zgloba, koji zajedno sa skapulotorakalnim zglobom i subakromijalnim prostorom tvore funkcionalnu kinetičku jedinicu. Glenohumeralni zglob je kuglasti zglob između glave humerusa i plitke glenoidne jame, čija je podudarnost pojačana fibrohrskavičnim labrumom.

Kapsuloligamentne strukture, uključujući gornji, srednji i donji glenohumeralni ligament te korakohumeralni ligament, pružaju pasivnu stabilnost ovisnu o položaju, posebno pri ekstremnim pokretima. Dinamičku stabilnost prvenstveno osigurava rotatorna manšeta (m. supraspinatus, infraspinatus, teres minor i subscapularis), koja komprimira i centrira glavu humerusa unutar glenoida tijekom pokreta i uravnotežuje kranijalnu translacijsku silu deltoida. Stabilizatori lopatice, uključujući m. trapezius, serratus anterior, rhomboideus i levator scapulae, održavaju optimalni položaj lopatice i doprinose skapulohumeralnom ritmu, koji obično osigurava oko jednu trećinu ukupne elevacije ruke kroz rotaciju lopatice prema gore. Poremećaj ovog ritma, poput diskineze lopatice, mijenja orijentaciju glenoida, povećava subakromijalni kontaktni tlak i predisponira impingement i patologiju manšete. Funkcionalno, rame omogućuje široki raspon pokreta u svim ravninama – fleksija-ekstenzija, abdukcija-adukcija i unutarnja-vanjska rotacija – podržavajući aktivnosti koje se kreću od onih osnovnih svakidašnjih do zahtjevnijih zadataka podizanja iznad glave i bacanja. Ova opsežna pokretljivost moguća je radi malih koštanih ograničenja, što sustav čini uvelike ovisnim o neuromuskularnoj kontroli i proprioceptivnom informacijama o stabilnosti. Razumijevanje ovih međuovisnih odnosa ključno je za točnu kliničku procjenu, interpretaciju radioloških prikaza i dizajniranje protokola kirurške rekonstrukcije i ciljane rehabilitacije kod pacijenata s poremećajima ramena, uključujući nestabilnost, oštećenja rotatorne manšete, adhezivni kapsulitis i degenerativnu patologiju zglobova.

Ključne riječi

rame, funkcionalna anatomija

FUNCTIONAL ANATOMY OF THE SHOULDER

Department of Physical medicine and Rehabilitation, Clinical Hospital Centre Osijek, Osijek, Croatia
Faculty of Medicine, University of Osijek, Croatia

The shoulder represents a highly mobile but unstable complex, in which coordinated interaction of multiple joints and soft tissue stabilizers enables precise upper limb function. Rather than a single articulation, the shoulder consists of the glenohumeral, acromioclavicular, and sternoclavicular joints, together with the scapulothoracic articulation and the subacromial space, forming a functional kinetic unit. The glenohumeral joint is a ball and socket articulation between the humeral head and the shallow glenoid fossa, whose congruence is enhanced by the fibrocartilaginous labrum. Capsuloligamentous structures, including the superior, middle, and inferior glenohumeral ligaments and the coracohumeral ligament, provide position-dependent passive stability, particularly at extremes of motion. Dynamic stability is primarily mediated by the rotator cuff (supraspinatus, infraspinatus, teres minor, and subscapularis), which compresses and centers the humeral head within the glenoid during motion and counterbalances the cranial translatory force of the deltoid. Scapular stabilizers, including the trapezius, serratus anterior, rhomboids, and levator scapulae, maintain optimal scapular positioning and contribute to the scapulohumeral rhythm, which typically provides approximately one third of overall arm elevation through scapular upward rotation. Disruption of this rhythm, such as scapular dyskinesis, alters glenoid orientation, increases subacromial contact pressures, and predisposes to impingement and cuff pathology. Functionally, the shoulder allows a broad arc of motion in all planes—flexion–extension, abduction–adduction, and internal–external rotation—supporting activities that range from basic self care to overhead and throwing tasks. This extensive mobility is achieved at the cost of bony constraint, rendering the system highly dependent on neuromuscular control and proprioceptive input for stability. Understanding these interdependent relationships is critical for accurate clinical assessment, imaging interpretation, and the design of both surgical reconstruction and targeted rehabilitation protocols in patients with shoulder disorders, including instability, rotator cuff disease, adhesive capsulitis, and degenerative joint pathology.

Keywords

shoulder, functional anatomy

References

1. Howe TE, Kell C. Functional anatomy of the shoulder complex. Physiotherapy. 1989;75(10):65664.
2. Halder AM, Itoi E, An KN. Anatomy and biomechanics of the shoulder. Orthop Clin North Am. 2000;31(2):15976.
3. Ludewig PM, Reynolds JF. The role of scapular dysfunction in shoulder pain: implications for evaluation and treatment. J Orthop Sports Phys Ther. 2009;39(2):90104.
4. Labriola JE, Lee TQ, Debski RE, McMahon PJ. Stability and instability of the glenohumeral joint: the role of shoulder muscles. J Shoulder Elbow Surg. 2005;14(1 Suppl S):32S38S.
5. Goetti P, Denard PJ, Collin P, Ibrahim M. Shoulder biomechanics in normal and selected pathological conditions. EFORT Open Rev. 2020;5(9):50818.
6. Meskers CGM, van de Sande MAJ, Rozing PM. Neuro-muscular control of the shoulder girdle: functional anatomy and clinical implications. Clin Orthop Relat Res. 2004;(419):12231.