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Original article

Relationship between thumb laxity and trapezium kinematics

Relation entre laxité du pouce et cinématique du trapèze

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Abstract

Objectives. – To investigate the relationship between thumb laxity (passive mobility), shape of the trapezium and trapezial mobility relative to the second metacarpal.

Methods. – Sixty normal volunteers were assessed for the amount of thumb laxity by measuring the shortest distance of the thumb nail to the radius when the thumb was forcefully approximated to the forearm with the wrist in flexion. The inclination of the distal surface of the trapezium (angle β) and the mobility of the trapezium relative to the II metacarpal (Δ angle α) were assessed using dynamic X-rays in maximal radial and ulnar deviation.

Results. – There was no statistical correlation between thumb laxity and shape of the trapezium (angle β). However, trapezium mobility (Δ angle α) and thumb laxity were strongly correlated ($P = 0.018$), with the more lax individuals registering higher trapezium mobility.

Conclusion. – This investigation does not support the concept of thumb hypermobility being associated to a trapezium with more pronounced inclination of its distal articular surface. However, it has been found that the higher the thumb mobility, the more the trapezium tilts under load.

Keywords: Thumb laxity; Trapezium motion; Trapeziometacarpal joint

Résumé

Objectifs. – Rechercher la relation entre la laxité du pouce (mobilité passive), la forme du trapèze et de la mobilité du trapèze par rapport au deuxième métacarpien.

Méthodes. – La laxité globale du pouce de 60 volontaires normaux a été évaluée en mesurant en millimètres la distance entre le radius et le centre de l'ongle du pouce lors du rapprochement extrême du pouce vers l'avant-bras, poignet en flexion. L'inclinaison de la surface articulaire distale du trapèze (angle β) et la mobilité du trapèze par rapport au deuxième métacarpien (Δ angle α) ont été mesurées sur des clichés dynamiques du poignet.

Résultats. – On n'a pas trouvé de corrélation statistique entre la laxité du pouce et la forme du trapèze (angle β). En revanche, la mobilité du trapèze par rapport au deuxième métacarpien (Δ angle α) et la laxité du pouce montrent une bonne corrélation statistique ($p = 0{,}018$) ; les pouces les plus lâches possèdent une plus grande mobilité du trapèze.

Conclusion. – Cette recherche infirme l'hypothèse selon laquelle l'hypermobilité du pouce est liée à la présence d'un trapèze avec une pente articulaire distale plus prononcée. En revanche, plus le trapèze bouge lors d'une surcharge axiale, plus mobile est le trapèze par rapport au deuxième métacarpien.

Mots clés : Laxité du pouce ; Mobilité du trapèze ; Articulation trapézométacarpienne

The trapezium-metacarpal (TMC) joint is a saddle-type articulation with a variable degree of anterolateral inclination. There is evidence suggesting that the more inclined the joint, the higher is the tendency for the TMC ligaments to attenuate with time, this inducing anterolateral subluxation of the

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metacarpal base and secondary degenerative osteoarthritis of the TMC joint [1–3]. Indeed, if the joint is substantially inclined and the constraining ligaments are insufficient or stretched out, significant subluxation of the metacarpal base occurs [4]. Whether increased subluxation tendency due to congenital passive hypermobility implies higher risk of developing joint degeneration, however, is controversial. While some authors have presented epidemiological data suggesting that patients with increased passive mobility of the thumb have higher incidence of degenerative TMC osteoarthritis [4,5], more recent epidemiological studies suggest the contrary, that hypermobility may be a protective factor for hand osteoarthritis [6]. The purpose of the present investigation is to determine whether there is a relationship between thumb laxity, distal trapezial inclination and trapezial motion during radioulnar deviation.

1. Patients and methods

Sixty normal volunteers (30 men and 30 women) with a mean age of 32 years (range: 18–48) were assessed for the amount of laxity (passive mobility) of their thumbs, by measuring in millimeters the shortest distance (D1) between the centre of the thumb nail and the radius while the thumb was passively and forcefully approximated to the forearm with the wrist in flexion (Fig. 1). The average of three separate determinations was used as an indirect sign of TMC laxity. In order to compensate for individual variations in hand size, that measurement was normalized to the length of the third metacarpal.

All volunteers were consented for posterior-anterior radiographs of their dominant wrist in maximal passive radial and ulnar inclination. The X-rays were taken with the volunteer seated by the exploration table, the hand and forearm lying flat on the surface of the X-ray plate, the forearm in neutral rotation, the elbow at 90 degrees, and the shoulder 90 degrees abducted along the plane of the scapula.

The trapezium inclination angle was defined by the line tangent to the two radial and ulnar convexities of the distal trapezial surface and a line tangent to the two most prominent points of the proximal trapezial surface (β-angle in Fig. 2). For the statistical analysis the average of three angular determinations was used.

The mobility of the trapezium relative to the second metacarpal was assessed by comparing the angle formed by a line tangent to the two radial and ulnar convexities of the distal trapezial surface and a line tangent to the two most prominent points of the lateral outline of the index metacarpal in both radial and ulnar deviated radiographs (α-angle in Fig. 2). Again, angle measurements were repeated three times and the averages were utilized for this study.

Once assessed for normality by the Kolmogorov-Smirnov test, the mean α-angle in radial inclination was compared to the same parameter in ulnar inclination by a Student's paired *t*-test. The relationship between thumb laxity, represented by distance D1, and trapezium mobility, represented by the variation (Δ) of the α-angle from radial deviation to ulnar deviation, was analyzed using the Pearson's correlation coefficient. The same correlation coefficient was utilized to compare the β-angle and thumb laxity. Significance was determined when *P* was less than 0.05.

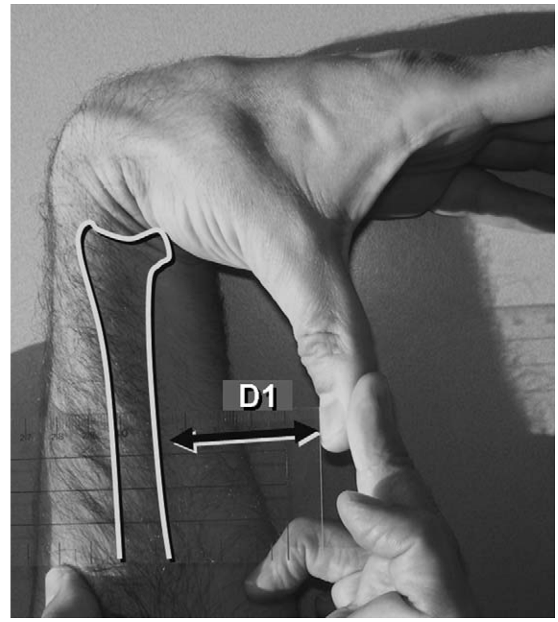

Fig. 1. Thumb laxity was indirectly determined by measuring the shortest distance (D1) between the center of the thumbnail and the anterior edge of the radius with the wrist in maximal flexion.

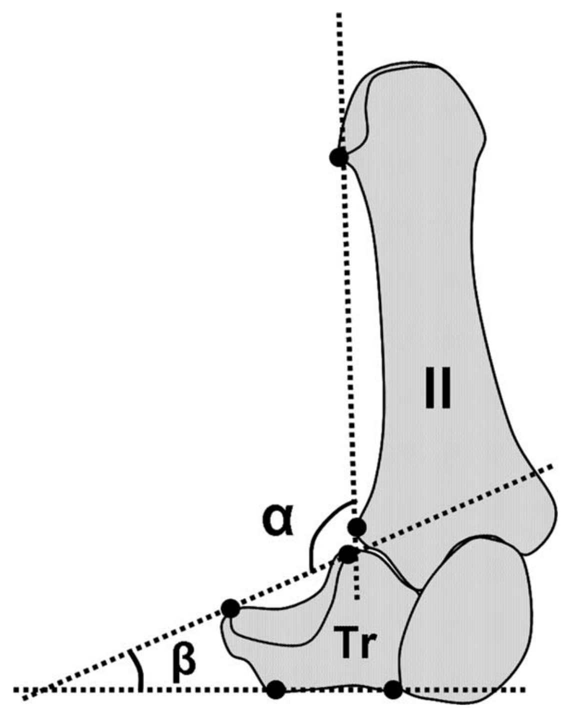

Fig. 2. Trapezial inclination was determined by the angle β, while trapezium mobility relative to the second metacarpal was measured by comparing the variation of angle α from radial deviation to ulnar deviation.

2. Results

The average distance D1 between the center of the thumbnail and the palmar surface of the radius when the