NORMAL FINGER PROXIMAL INTERPHALANGEAL (P. I. P. -) JOINT SURFACES SHOW ASYMMETRIES AND INCONGUENCES IN THE CORONAL (FRONTAL) PLANE

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INTRODUCTION

Movement possibilities of normal proximal interphalangeal (P. I. P. -) joints in human fingers were recently analyzed, anatomically (1). As also seen in vivo at our own hands (Fig. 1, top) (2), the P. I. P. - joint is for convenience classified as a hinge joint (Fig. 1, bottom) (3). Careful observation, however, reveals extra movement possibilities, namely (models) longitudinal rotations of the P. I. P. - joint (Fig. 3) (4, 5). By plane geometry applied in frontal (coronal) plane HR-AMI of the mating articular surfaces in situ, we elucidated their asymmetries and incongruences. To our knowledge, these have only been analyzed earlier by ostology (6).

OBJECTIVES

Our outcomes data may help to design better digestion-resistant prosthetic implants for P. I. P. - joints.

RESEARCH QUESTIONS, MATERIAL AND METHODS

As (4) rightly states, the “asymmetry of the condylar surfaces in the anteposterior plane would require a profile projector to be analysed more accurately with a protractor.” In this study, as shown in the frontal (coronal) plane, we first aimed to quantify the asymmetries of the radial and the ulnar condyles (Fig. 2). This was done by superimposing a grid (8) on the frame (Fig. 7). Second, by analysing the contours in frontal plane of the thumbs of normal condyles (compare at base of second phalanx, and condyles at head of first phalanx), we examined what extent these articular condyles match. Therefore we constructed their radial plane geometry (9) (Fig. 8) with computer graphics (10). Shorter radii mean stronger convexities / concavities (11, 12)

RESULTS

The two pairs of curvatures of the articular surfaces were analysed separately. In Fig. 9 a, the contours of the other curvatures are plotted on the HR-AMI slice, resulting in the inscribed open polygon for the articular profile of the first phalanx. A comparable graphical construction gave the inscribed open polygon R. C. 7.0 for the second phalanx. With mathematical computer graphics (10), we constructed the perpendicular bisectors of the contours of both curvatures. This resulted in points of intersection and the corresponding polygons. The result is shown in Fig. 9 b.

ADDITIONAL MEASUREMENTS

Within the P. I. P. - joint, the outer edges of the condyles are accompanied by wedge-shaped soft tissues consisting of the thin synovial lining at the inner sides of the joint capsule. Small structures contribute to the side-posed position at elements (coronoid processes in cartilage) and synovial fluids are acquired in our HR-AMI by their interlacing appearance (Figs. 6, 11, 12). They thus show a somewhat V-shaped A-line form, the outer HR-AMI (Fig. 11) a), b) for comparison, and the radial side (Fig. 11 e) and d) for the superimposed grid (8) (the sizes were equalized, namely about 0.1 x, 0.15 squares respectively (Figs. 11 b, d)). This means, that here the larger (ulnar) condyles have a smaller synovial fold, whereas the smaller (radial) condyles are accompanied by a larger synovial fold.

REFERENCE


