EVALUATION OF THE PROXIMAL ARTICULAR SET ANGLE

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Hallux abductus is both a structural and positional deformity. Structural abnormalities are determined preoperatively by radiographic measurement. The angular relationship in the evaluation of the hallux valgus deformity that is subject to the greatest latitude in interpretation is the proximal articular set angle (PASA).

PASA is formed by the intersection of the long axis of the first metatarsal and the articular surface of the hallux. The bisection of the long axis of the first metatarsal is easily determined and reproducible. The position of the articular surface is determined indirectly by indicating the underlying subchondral bone, not direct measurement of the actual cartilaginous surface. The medial and lateral-most aspect of the joint surface is identified and a line is drawn between these points.

It has been determined however, that these parameters are not accurately reproducible between practitioners, and poorly correlate with the intra-operative evaluation. There is also significant variance in measurements of the PASA when the joint surface is visualized in surgery. Additionally, the measurement of the effective articular surface assumes that the hallux sits at a right angle to the drawn articular set, which is not true in all circumstances. For example, if the articular cap is a prefect conical shape, the long axis would be perpendicular to the articular set line. However, if the articular cap is eccentrically shaped, its long axis would now be oblique to the articular surface. (Figure 1)

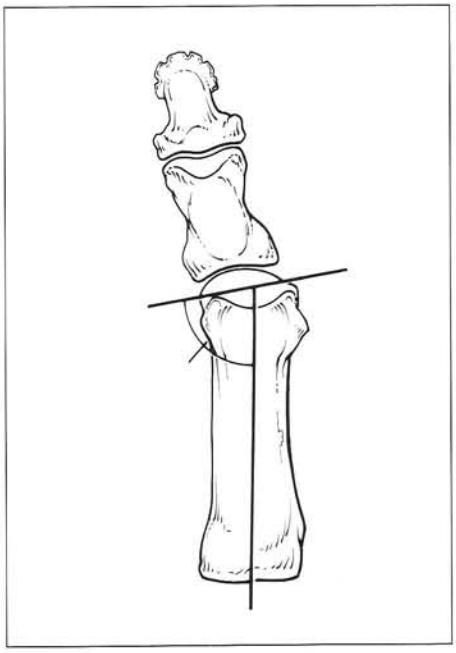

Figure 1. An eccentrically shaped metatarsal head. Although the PASA is deviated, the hallux remains rectus.

Since the PASA is difficult to accurately measure and may not reflect the true articular position of the metatarsal head, the author determines the articular set angle anatomically by a method which is simple, accurate, and reproducible. Examination of the metatarsal head reveals a sagittal plane groove medially. (Figure 2) When the base of the proximal phalanx sits in this groove, the hallux is in the anatomically correct position, and the joint is congruous.

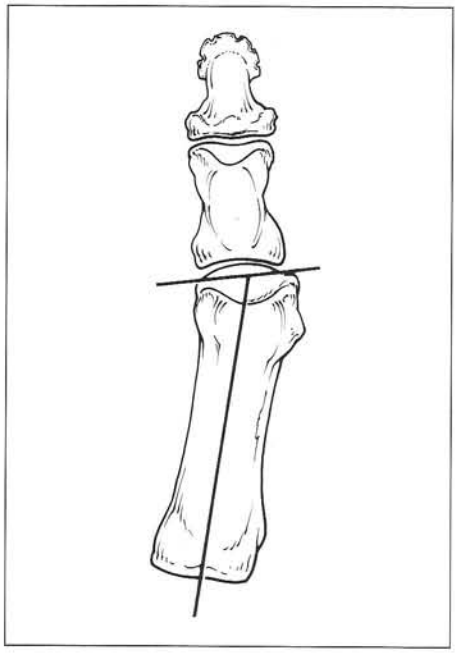

Figure 2. View of the metatarsal head demonstrating the sagittal groove which articulates with the base of the proximal phalanx.

Figure 3. Preoperative radiograph of hallux valgus deformity. A significant PASA is measured.

This anatomic relationship can now be applied to clinical and radiographic evaluation of the PASA. Preoperatively, the hallux can be adducted on the metatarsal head until end range of motion is met (the base of the phalanx sits in the medial sagittal groove). The position of the hallux in relation to the first ray can now be visualized. An x-ray taken in this position will confirm joint congruity and measurements of the articular surface can be accurately obtained. (Figures 3, 4) In a small percentage of cases, this procedure can be performed secondary to soft tissue contracture.

Figure 4. Joint congruity has been restored intraoperatively and an x-ray is taken. No real joint deviation is observed.

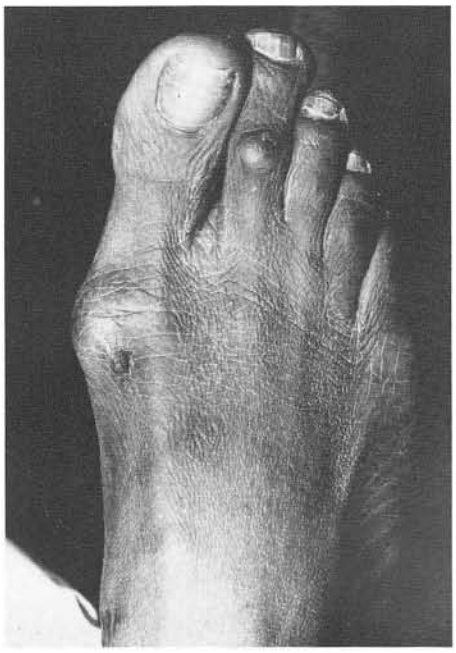

Figure 5A. A moderate HAV deformity.

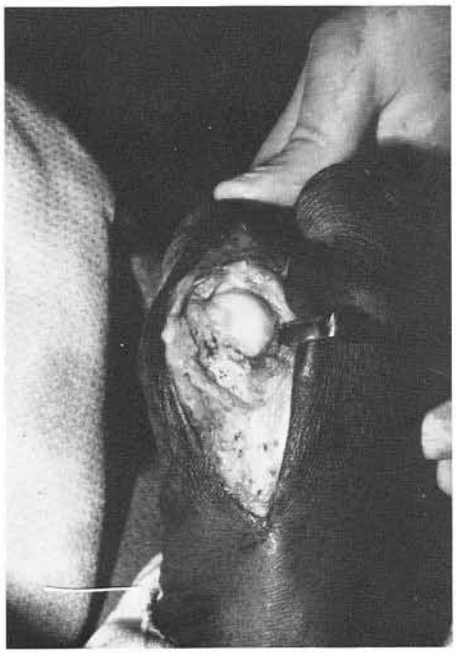

Figure 5B. Intra-operative evaluation of the joint surface shows an apparent lateral deviation.

Figure 5C. With the joint held in anatomic congruity, no lateral deviation is noted.

Ultimately, final judgement is made by direct visualization of the joint surfaces intraoperatively. After the joint is opened and a lateral release performed, the base of the proximal phalanx is placed in the sagittal groove and the articular position is observed. This will give an anatomically accurate representation of the articular surface. (Figures 5A-C)

Structural adaptation of the metatarsal head and the base of the proximal phalanx is a well accepted consequence of the HAV deformity. Proper orientation of these joint surfaces is an important concept in HAV repair. The author feels that radiographic measurements of the PASA and DASA are inaccurate to the point of being misleading. Intra-operative evaluation with the hallux placed in its anatomically congruent position provides a simple and accurate evaluation of the transverse plane structural alignment of the first metatarsophalangeal joint.

BIBLIOGRAPHY

Amarnek DL, Mellica A, Jacobs AM, Oloff LM: A Statistical Analysis of the Reliability of the Proximal Articular Set Angle. *J Foot Surg* 24:39-43, 1986.

Sullivan ET, Robinson JB, Palladino SJ: Inter-evaluator Variability in the Measurement of the Proximal Articular Set Angle. *J Foot Surg* 27:466-468, 1988.