THE EFFECTS OF SYMPHYSIOTOMY ON THE BANTU FEMALE SACRO-ILIAC JOINT*

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An unbiased attempt to evaluate the effects of lateral separation of the pubic rami on the posterior pelvic joints requires avoidance of generalizations. It is therefore proposed to deal only with the obstetrical operation of symphysiotomy on the full-term pregnant Bantu female.

It is dangerous to be dogmatic about the sacro-iliac joint. Any assessment of permanent injury or damage to this articulation needs intimate knowledge of the many variations from the normal, if indeed there is a norm, exhibited by this joint in its healthy state. What are the factors to be considered?

1. *Classification*

The joint does not admit of satisfactory anatomical classification, as witness the variety of descriptions.[9, 10, 11] Smout and Jacoby's ingenious but clumsy classification, namely as a diarthrodial heteromorphic atypical hinge joint, is even inadequate. Phylogenetically, the obstetrical function is subordinated to the weight-bearing function in man.[7] Nevertheless, the remnant obstetrical function influences the joint to such a degree that sexual differentiation, especially in regard to mobility, is pronounced.

It has been clearly shown that the elderly male possesses a physiologically ankylosed joint,[3, 4, 8, 14] whereas its female multiparous counterpart has joint mobility equalling or in excess of that of young males or nulliparae. The 75-year-old male therefore has a joint which is a synarthrosis, and the 75-year-old multiparous female is in possession of a diarthrosis. It follows, therefore, that evidence of commencing ankylosis on the articular surfaces of middle-aged males, especially near the dorsal border of an auricle, is no indication of joint pathology. This naturally also applies to the nulliparous female joint.

Any interpretation of bony changes on the articular aspects of Bantu joints must apparently be accompanied by extreme circumspection. In the South African Bantu there exists a noticeable and apparently inconsistent variety of morphological patterns of joint architecture.[12] In Weisl's study[14] of the articular surfaces of the sacro-iliac joint no mention is made of morphological inconsistency; this investigation was carried out on Europeans and the question of the existence of racial differentiation becomes actual.

2. *Bony Details*

Roentgenological studies of pelvic trabeculation on the basis of the Meyer-Wolff law of transformation of bone lends impressive support to the supposition that the sacro-iliac joints are the weak links on the bony supporting arch of the pelvis. From this the possibly fallacious conclusion can be reached, that the small bony shelf on the ventral border of the iliac auricular surface supports the arch of the pelvic bridge.

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The Meyer-Wolff law, interpreted in terms of trabecular patterns only, is open to serious criticism in view of the impressive experimental work by Honor B. Fell.[6, 5] The weak bony ridge or shelf on the lower border of the iliac articular surface appears to be of recent origin, and is most probably the result of bone apposition according to Roux's principle.[13] It is possibly an overflow of thwarted growth due to forceful obstruction from the ventral edge of the sacral auricular surface at the time of increased pubertal growth activity.[7, 12] Brailsford's observation[1, 2] on increased pronunciation of the pre-auricular sulci in multiparae can be explained by further stimulation of bone apposition on this shelf of bone as a result of tension within physiological limits. The direction of this tension completely invalidates any theory of supportive function of this small ridge.

3. *Ligaments and Accessory Ligaments*

Microscopical studies show that under the influence of 'relaxin' during pregnancy fundamental changes occur in collagenous structures. It is not my intention in a brief paper to pursue the complexities of this very definite but little-known reaction. Suffice it to state that, presumably as a result of the action of a fraction of the corpus luteum hormones of pregnancy, the collagenous component of the Bantu female symphysis pubis is subject to the following changes (Figs. 1 and 2).

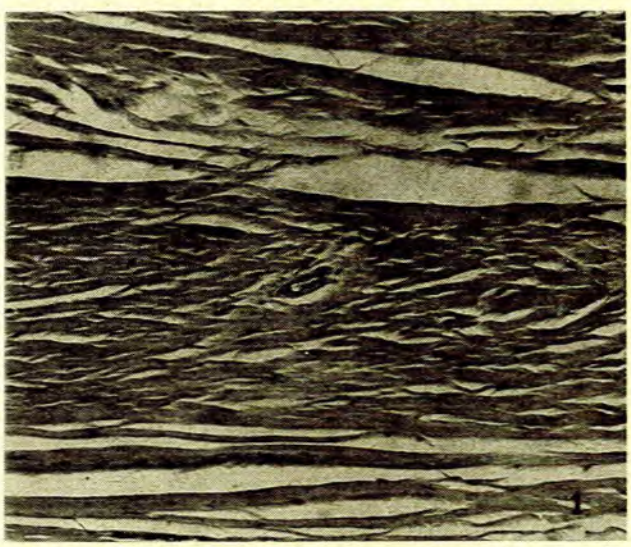

Fig. 1. Photomicrograph of anterior symphysial ligament of Bantu female (non-pregnant) aged 34 years. H and E × 120.

(*a*) An approximately 100% increase in thickness.

(*b*) A very noticeably increased vascularization.

(*c*) A marked increase and hypertrophy of individual collagen fibres. This is associated with an appearance of elasticity as compared with the elongated straight and thin fibres of the ligaments not influenced by the hormone. Changes from a small deep-staining pyknotic nucleus to a larger swollen pale-staining nucleus seem to indicate a basic cellular reaction.

There is very good reason to believe that this reaction is not localized to the anterior pelvic joint, but that the whole body is affected by the hormone. If so, then the ligaments and accessory ligaments of the sacro-iliac joint are also affected. Experimental evidence appears to confirm this.[12, 15]

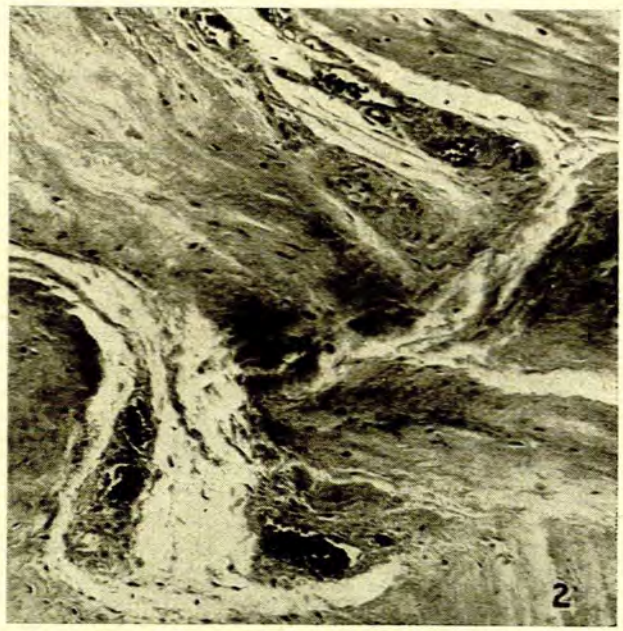

Fig. 2. Photomicrograph of anterior symphysial ligament of pregnant Bantu female aged 38 years. H and E × 120.

If, then, the ligamentary changes in the posterior pelvic joints are similar to those in the anterior pelvic joint a case could be argued for greatly diminished control of joint movement by the thin anterior and thick posterior joint ligaments, as well as the more remote and accessory sacro-tuberous and sacrospinous ligaments. The latter two appear to control only very exaggerated movements of the joint. The greatly increased elasticity would also protect against early ligamental damage.

Macroscopically, therefore, during or immediately after pregnancy, it is extremely difficult to estimate whether damage to these ligaments is apparent or real.

4. *Mechanics*

The study of sacro-iliac joint movements is a profound one in its own right. Because of inaccessibility of the joint, statements on mobility in the living subject have for many years depended on deductive evidence. With the advent of precise radiographic techniques impressive studies have been made which show a surprisingly wide range of sacral movements of a rotatory nature.[15]

It is surprising that for nearly a century the importance of the active lateral movement of the innominates on the sacrum has been completely disregarded. Investigations on the mechanics of the joint have mainly been directed towards sacral rotation, despite the fact that the latter can hardly occur without prior ventral widening of the joint. It is perhaps more correct to say that the two movements are nearly synchronous, although the lateral movement is the primary one.

Recent experimental evidence appeared to indicate that this lateral movement is an active one brought about by muscular action.[12] Further radiographic evidence of this movement has since been obtained. It is not proposed at this stage to deal in detail with the methods employed, nor with all the results that were obtained. In the main, previous methods[12] were employed except that additional studies

were made in positions of trunk and thigh flexion, and only symphysial widening was accepted as an absolute indication of lateral movement of the innominates. The following relevant results were obtained:

(*a*) Lateral movement of the innominates at the sacro-iliac joint as a result of muscular action occurred in every one of 35 subjects examined.

(*b*) Where the movement was a requirement of muscular action as a result of trunk extension (33 cases) a positive result was obtained in all 33 cases. Where the movement was a requirement of active trunk and thigh flexion (17 cases) again a positive result was obtained in all 17 cases.

These 100% positive results (*a* and *b*) are deemed statistically significant.

(*c*) The increase in width of the symphysis in 15 Bantu subjects (reflecting in direct proportion the extent of the gaping movement at the sacro-iliac joint) was on an average 39% greater during the act of trunk and thigh flexion than during trunk extension. Actual figures relative to the average increase in symphysial width were 1·52 mm. in extension and 2·11 mm. in trunk and thigh flexion. This ratio is more or less maintained by both multiparae and primiparae. Trunk and thigh flexion is of course associated with expulsive efforts during the second stage of labour.

(*d*) Approximately one-third of the pre-labour X-rays of the 15 Bantu subjects show 'vacuum' formation in the symphysis pubis. These 'vacuums' all disappeared on the subsequent postpartum photographs. As vacuum formation is authoritatively regarded as a sign of traction or tension resulting in separation of articular surfaces,[2] it would seem that there might be noticeable tension in the symphyseal joint during pregnancy. This tension can only be effected by active sacro-iliac widening.

Collectively the above considerations appear to indicate an obstetrical as well as a weight-bearing function in the Bantu female sacro-iliac joint. This function presents primarily as a lateral movement of the two innominates on the sacrum.

Symphysiotomy aims at moving the pubic rami in a lateral direction, i.e. it artificially creates a lateral movement in the sacro-iliac joints. Is this movement, then, within reasonable limits unphysiological? It seems that the answer is no.

OPSOMMING EN GEVOLGTREKKING

1. Anatomiese oorwegings, wat ontogenetiese, mikroskopiese en meganiese studies insluit, dui op 'n obstetriese werking by die iliosakrale gewrig van die vroulike Bantoe.

2. Hierdie funksie word grotendeels geopenbaar deur 'n dwarsbeweging van die innominata op die kruisbeen.

3. Die verloskundige ingreep van simfisiotomie bewerk hierdie beweging kunsmatig. Binne redelike perke is hierdie beweging nie onnatuurlik en ook nie skadelik nie.

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