Pelvic Inclination-Implications for the Hip

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ABSTRACT: Uncovering of femoral head anteriorly was observed with posterior tilt of pelvis in cadaveric hips. Cover was restored with anterior tilt. Three clinical cases showed changes of the pelvic tilt with standing and lying down. Failure to recognise this contributed to poor results following surgery in one patient. A relationship of the pelvic tilt to lordosis of the lumbar spine was demonstrated. A plea is made for radiological assessment of the hip to be made in the erect and in the supine positions before surgery on that joint to better study the relationship of the acetabulum to the femoral head.

INTRODUCTION

Salter et al[1] alluded to the lack of anterior and lateral coverage of the hip in patients with congenital hip subluxation and dislocation. His innominate osteotomy addressed both problems. We felt that an abnormal pelvic inclination may also result in loss of anterior cover of the femoral head. While the lack of lateral cover may be obvious in plane X-rays, deficient anterior cover may easily be missed.

We performed cadaveric studies to show that the pelvic inclination especially posterior may result in uncovering of the femoral head anteriorly.

We also demonstrated this matter in three patients the posterior tilting of the pelvis on adoption of the upright posture and the untoward effects on one patient from our failure to recognise this.

We appeal for more widespread use of radiographs of the hips in the erect weight bearing physiological position when planning surgery for these joints.

MATERIALS AND METHODS

Cadaveric study

We used ten normal fresh pelvis with the hips and lumbar spine attached but denuded of all soft tissue.

The radiographs and clinical photographs were taken with the pelvis in neutral anteriorly tilted and posteriorly tilted position respectively.

The capsules were excised anteriorly and the amount of bony acetabular cover of the femoral head anteriorly in each of the 3 positions was determined.

RESULTS

In all ten pelvis, the femoral heads were uncovered significantly in the front when the pelvis were tilted posteriorly (Fig. 1a). Bony coverage was total in the neutral and anterior tilted positions (Fig. 1b).

Clinical study

Three patients were reviewed.

The first patient was a fifty-eight year old housewife presented with habitual involuntary anterior dislocation early on one side and late on the opposite side of bilateral total Charnely Muller hip arthroplasties performed for primary osteoarthritis. The hips dislocated spontaneously on the adoption of an upright posture with spontaneous relocation on lying down. Radiographs showed the obvious change in the inclination of the pelvis to a posterior tilted position on standing (Fig 2a) resulting in an uncovering of the femoral components and dislocation; cover was reestablished with an anterior tilting of the pelvis and relocation of the hips on lying down (Fig 2b).

A revision of the left hip acetabular component to a more horizontal position providing lateral and adequate anterior coverage revolved symptoms on that side. The revision of the opposite hip is being planned.

The second patient presented with osteoarthritis of the left hip. The X-rays (Fig 3a and 3b) showed the change in pelvic inclination on standing and lying down respectively. The total hip arthroplasty was carried out with the acetabular component positioned to provide sufficient anterior coverage for the femoral component when the patient was erect. Postoperatively she was good and able to ambulate without aids.

The third patient presented with backache from degenerative lumbar spondylosis. Plain films (Fig 4a and 4b) of the pelvis revealed a posterior tilting in the upright position. Loss of lumbar lordosis from painful muscle spasm on standing was

Figure 1 A : Uncovering of the femoral head anteriorly with posterior tilt of the pelvis.

Figure 1 B : Cover restored with anterior tilt of the pelvis.

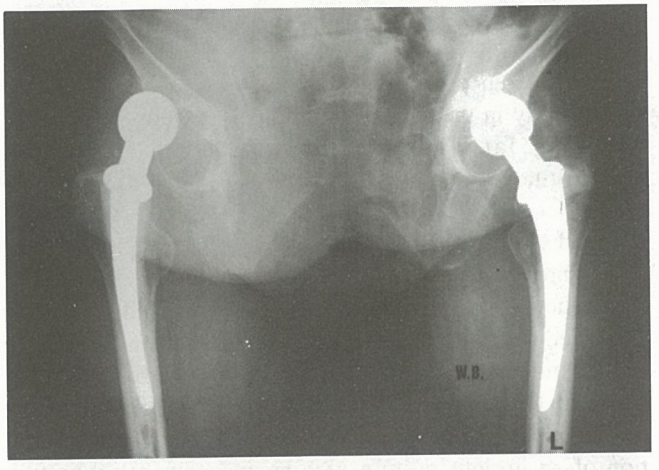

Figure 2 A : Bilateral dislocation of total hip replacement on standing. Note obvious posterior tilt of the pelvis.

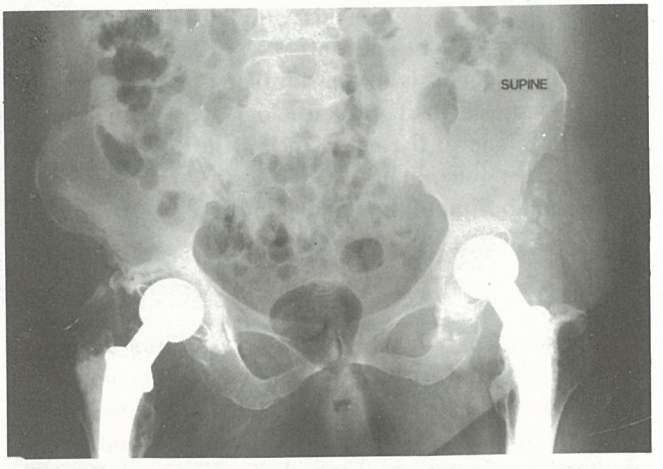

Figure 2 B : Hips reduced in supine position with restoration of anterior tilt pelvis and anterior cover.

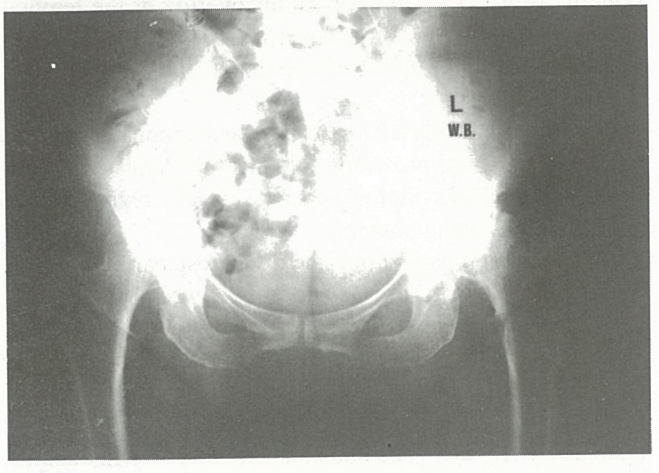

Figure 3 A : Posterior tilt of pelvis on standing in patient with osteoarthritis of left hip.

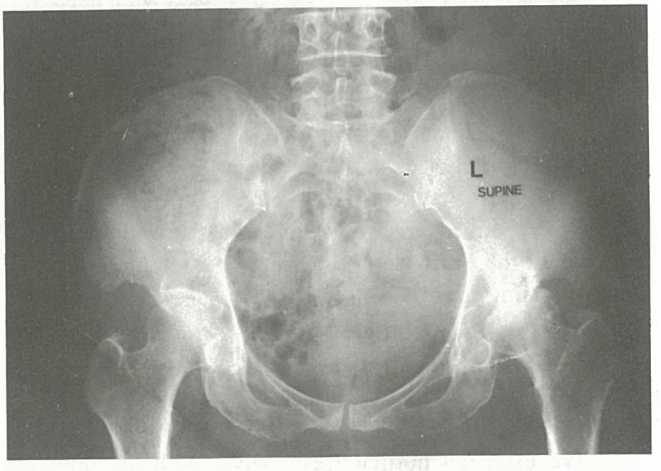

Figure 3 B : Anterior tilt of pelvis in supine position in the same patient.

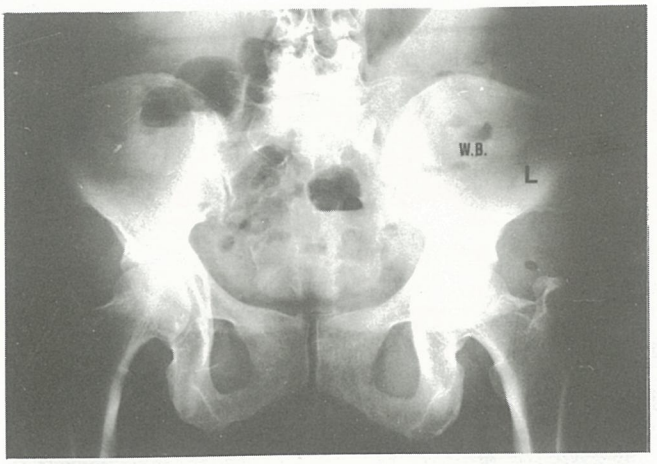

Figure 4 A : Posterior tilt of pelvis in standing in patient with backache.

Figure 4 B : Anterior tilt of the same pelvis on lying down.

probably reponsible for this abnormal pelvic inclination and has revealed the important relationship of the lumbar spine to the pelvic tilt.

DISCUSSION

This study illustrated another cause of the lack of coverage of the femoral head-a posteriorly tilted pelvis. This entity has not been described previously. Failure to recognise this cause resulted in an unusual habitual anterior dislocation of the bilateral hip arthroplasties in Case 1. Awareness of this entity enabled us to provide sufficient anterior acetabular cup cover in Case 2. Khan et al[2] reported a 22% failure rate for revisions of hips for the dislocations. Failure to recognise the posteriorly tilted pelvis on standing with anterior uncoverage of the femoral components may be responsible for some of the resistant dislocations encountered in practice.

Knowledge of the alteration of the pelvic inclination would also be useful in planning osteotomies around the hip both femoral and acetabular and also for selecting the ideal position for hip arthrodesis. The subtle lack of anterior coverage due to the abnormal pelvic inclination in some patients may even lead to the development of so-called "primary" osteoarthritis.

The relationship of the lumbar spine to the pelvic tilt has been adequately studied[3,4]. However, its relationship to the hip joint surgery has not been demonstrated. A flexion contracture of the hip with anterior tilt of the pelvis will lead to a lumbar lordosis. A vice versa relationship follows. Loss of the lumbar lordosis following extensive laminectomy or the painful paraspinal muscle spasm as in Case 3 can therefore, lead to the posterior pelvic tilt and the uncovering of the femoral head anteriorly.

Radiological investigation of the hips may need to be carried out in the upright rather than in just the supine position to better study the configuration of the pelvis before surgery around the hip. The plea is made for such an investigation as a routine following this study.

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