

A NEW DESIGN OF THE CHRISTIANSEN ENDOPROSTHESIS

Report of Two Cases in which Separation of the Two Components of the Prosthetic Head Occurred

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Primary prosthetic replacement in elderly patients with displaced intracapsular fracture of the femoral neck has been used during the last few years with encouraging early results. The prosthetic device preferred has been Christiansen's endoprosthesis. During the past year a new type with separable plastic head and metallic cap has been used. This modification has resulted in the occurrence of a previously unknown complication, a separation of these two parts, necessitating reoperation and insertion of a new head piece. The possible mechanisms causing this separation are discussed.

Key words: hip joint; joint prosthesis; orthopaedic equipment; prosthesis design

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Since 1970 we have used the "trunnion-bearing" endoprosthesis of Christiansen for routine prosthetic replacement in patients over 65 years of age with displaced intracapsular fracture of the head of the femur. The preliminary results have been satisfactory (Søreide et al. 1975).

We would like to present a previously unpublished complication. In two patients operated on and fitted with Christiansen's endoprosthesis a dislocation of the plastic head from the metallic cap necessitated reoperation and replacement of the dislocated head.

CASE REPORTS

Case 1: The patient was a 78-year-old woman who in January 1975 sustained a displaced intracapsular fracture of the femoral head. She was given operative treatment with reduction and internal fixation. Three months later X-ray

investigation showed a secondary displacement of the operated fracture. The nail was removed and a Christiansen endoprosthesis inserted. Recovery and rehabilitation after the operation were normal and the primary result satisfactory. Nearly 4 months after the operation the patient was admitted again, this time because of acute pain and difficulty in walking. X-ray revealed a dislocation of the head piece of the prosthesis which was initially suspected to be a luxation in the "trunnion-bearing" connection (Figure 1). An attempt at non-operative reduction failed. At the subsequent operative exploration no dislocation was found in the "trunnion-bearing" junction, but the plastic head had slipped out of the covering metallic cap. It was impossible to reduce the dislocation because of a disproportion between the two parts, possibly due to a swelling of the plastic head. Both head and cap were removed and replaced by a new piece. The postoperative course was again uneventful and at later visits the patient has been satisfied and objectively has a good functional result.

Case 2: The patient was a 75-year-old woman. At the end of April 1975 she fell on the floor and sustained a severely displaced intracap-

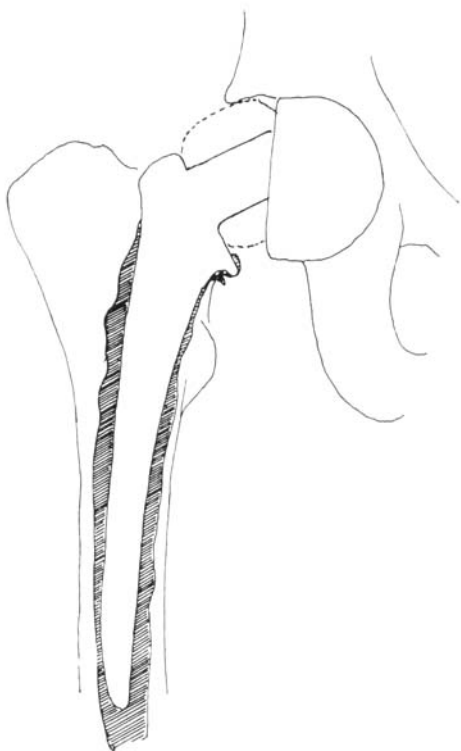


Figure 1. X-ray and diagram showing dislocation between the two head pieces, the metallic cap separated from the plastic head.

sular fracture of the femoral head. She was operated on and fitted with a Christiansen endoprosthesis and had an initially uncomplicated postoperative course. About 4 months later as she was rising from a chair she suddenly experienced severe pain in the operated hip and was later unable to walk. X-ray investigation revealed a dislocation between the metallic cap and the plastic head. No attempt was made to reduce the dislocation non-operatively, but at surgery an identical situation to that in Case 1 was found. The dislocated plastic head and metallic cap were removed and a new head piece inserted. The postoperative course was uneventful and the postoperative result satisfactory.

DISCUSSION

The first femoral head prosthesis introduced by Christiansen in 1965 con-

sisted of a shaft made of stainless steel connected through a "trunnion-bearing" with a head piece made of synthetic plastic material (Christiansen 1969). The initial clinical results were satisfactory (Ramstad 1969), but with a longer observation time results were disappointing (Kavli & Sundal 1974, Kavli et al. 1975). It appeared that in patients reoperated on or investigated at autopsy a substantial abrasion of the plastic head with deformation and secondary serious reactive synovitis and osteoporosis were found. To avoid abrasion the head was then equipped with a steel cap. In the original construction the cap was firmly attached to the plastic head. Since 1973 this detail has been modified and in the prosthesis

Figure 2. Christiansen's endoprosthesis. Above, the latest modification with trunnion-bearing, Delerin head and metallic cap separated. Below, the original modification of the prosthesis with the cap attached to the plastic head.

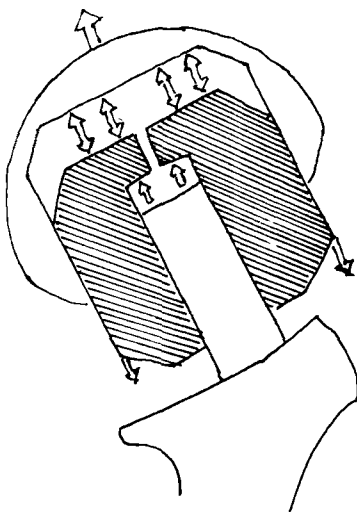
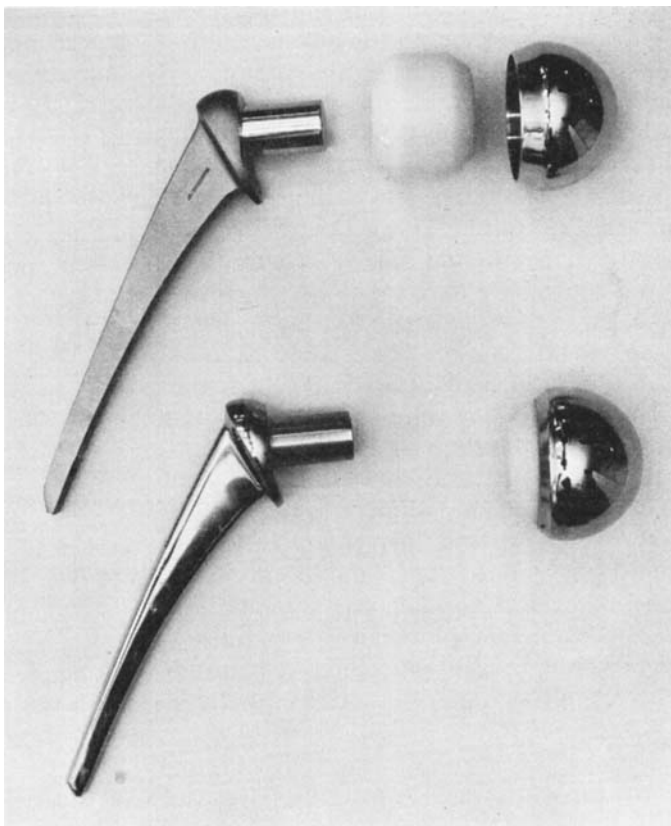


Figure 3. Possible hydraulic mechanism in the system between the trunnion-bearing joint and the covering metallic cap. Increased pressure occurring in the space between the head and the cap leading to dislocation between the metallic cap and the plastic head.

which now prevails the plastic head is separated from the steel cap (Figure 2). This modification has the advantage that the prosthesis pieces may be sterilized in an autoclave. Furthermore this modification is supposed to permit some degree of movement between the head and the cap (Christiansen 1974).

The mechanism of dislocation in the above-mentioned cases is uncertain. In both patients, however, a clot of fibrin and blood (approx. 15 cm³) was found in the bottom of the steel cap. It is possible that this clot under certain circumstances has closed the hole in the bottom of the plastic head causing a sort of valve mechanism, letting blood or tissue fluid into the steel cap but not out. Furthermore a hydraulic mechanism is possible in the system between the trun-

nion-bearing junction and the cap (see Figure 3) pumping the head out of the cap. The difference in the length of the tap and the height of the head (26 and 16 mm, respectively) possibly explains the fact that the dislocation occurs between the head piece and the cap and not in the tap joint. Theoretically even a wrongly positioned shaft component could contribute to the dislocation. However, in our two patients the shaft pieces were adequately inserted. Another possibility would be a tight fit between the metallic cap and the acetabulum resulting in a binding of the metallic cap and increased rotational stress at the plastic-metallic junction.

It is evident that this complication is found only in the latest modification of the prosthesis. Though uncommon, this is a serious complication necessitating reoperation in this advanced age group with increased operative risks. A firm

attachment between the cap and the plastic head prevents this complication and consequently it seems reasonable revert to this original modification.

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