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Stability of Uncemented Cups — Long-Term Effect of Screws, Pegs and HA Coating
A 14-Year RSA Follow-Up of Total Hip Arthroplasty

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ABSTRACT

Screws, pegs and hydroxyapatite-coating are used to enhance the primary stability of uncemented cups. We present a 14-year follow-up of 48 hips randomized to four groups: press-fit only, press-fit plus screws, press-fit plus pegs and hydroxyapatite-coated cups. Radiostereometric migration measurements showed equally good stability regardless cup augmentation. The mean wear rate was high, 0.21 mm/year, with no differences between the groups. Seven hips had radiographical osteolysis but only in hips with augmented cups. Cups without screw-holes compared with cups with screw-holes resulted in better clinical outcome at the 14-year follow-up. Thus, augmentation of uncemented cups with screws, pegs, or hydroxyapatite did not appear to improve the long-term stability compared with press-fit only.

Initial stability of uncemented cups is essential for good long-term results. Therefore, uncemented cups are often augmented with screws or pegs in order to improve primary fixation [1–3]. Cadaver studies have shown that screws increase initial stability [2–4]. However, the use of screws has also been discussed as a potential risk for developing osteolysis around the cup [5,6].

Hydroxyapatite (HA)-coating is intended to stimulate bone ingrowth and thereby both seal the gap between bone and implant and give better initial stability [7]. On the other hand HA-coating has been reported to increase the wear-rate [8]. Furthermore, register studies have shown a higher risk for aseptic loosening and a slightly higher risk for an isolated liner revision in HA-coated cups [9,10].

During the years 1995 to 1997 a prospective randomized control trial (RCT) designed to compare 4 different modes of primary fixation of the uncemented cup using radiostereometry (RSA) was performed at the orthopedic departments at Umeå (68 hips, 63 patients) and Uppsala University Hospitals (19 hips, 18 patients).

In all patients an ethylene oxide (EtO) sterilized polyethylene (PE) liner was used, however different stems and femoral heads were used at the different departments. In Umeå, the patients received zirconium oxide femoral heads combined with cemented femoral stems, whereas in Uppsala cobalt-chromium heads with cemented or uncemented stems were used.

The results after 5 years for this combined material have been presented earlier [11]. The main findings at 5 years were a fairly high rate of wear of the EtO sterilized PE liners with no difference between the groups, and a tendency to less migration and less radiolucent lines of the HA coated cups.

In 1994–1995, when the study was planned, ethylene oxide sterilized polyethylene (PE) liner and the first generation zirconium oxide ceramic femoral heads were new materials and their combination looked promising. By current knowledge this was an unwise choice since both of these materials lead to massive PE wear in THA [12]. When this fact became known it was decided to more thoroughly follow up the cohort patients operated in Umeå with this type of articulation.

Therefore, the goal of the present study was to evaluate the PE wear, quality of cup fixation and potential osteolysis after 14 years in the cohort of 68 hip arthroplasties (63 patients) operated in Umeå using EtO sterilized PE articulating against zirconium oxide femoral heads.

Patients and Methods

In the combined RCT study a total of 87 hips in 81 patients were operated [11]. The cohort operated in Umeå comprises 68 hips in 63 patients with primary or secondary osteoarthritis (OA) (Table 1). Five

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Table 1
Clinical Data of the Patients at the Time of Index Operation.

Clinical Characteristics	PF	PF + Screws	PF + Pegs	PF + HA	Total	*P*-Value
Number of hips	17	17	17	17	68	
Sex (male/female)	7/10	7/10	10/7	9/8	31/32	.662
Age (years)	55 (39–65)	56 (40–65)	56 (40–64)	58 (36–66)	56 (36–66)	.804
Weight (kg)	75 (54–100)	72 (51–90)	81 (57–100)	79 (55–102)	75 (51–102)	.095
Smoker (yes/no/unknown)	3/13/1	3/14/0	3/11/3	5/9/3	12/44/7	.628
Operated side (left/right)	6/11	6/11	12/5	7/10	31/37	.118
Osteoarthritis (primary/secondary)	14/3	13/4	12/5	13/4	52/16	.884
Charnley group [12] (A/B)	10/7	7/10	7/10	13/4	37/26	.118
Cup size (mm)	54 (52–58)	56 (50–60)	56 (52–60)	58 (48–62)	56 (48–62)	.268
Cup inclination (degrees)	50° (38–64)	49° (35–61)	46° (39–60)	54° (42–67)	51° (35–67)	.105

68 hips in 63 patients, 5 patients are included with both hips, no patient is included in the same group twice, continues variables shown as median (range). Four cup-groups: PF (press-fit only), PF + screws (press-fit plus 3 screws), PF + pegs (press-fit plus 3 pegs), PF + HA (press-fit plus hydroxyapatite coating).

* Pearson chi-square test.

** Kruskal–Wallis test.

patients had both hips operated in operations staged a mean 7 months in between. The patients were recruited from 333 consecutive total hip arthroplasties being performed during the period of the study in Umeå (Fig. 1). Exclusion criteria were: age >70 years, rheumatoid arthritis, osteoporosis, Paget's disease, malignancy or grossly abnormal hip anatomy.

In all patients, a hemispherical porous-coated titanium alloy cup (Reflection, Smith&Nephew, Memphis, TN, USA) was used. The 2 to 3

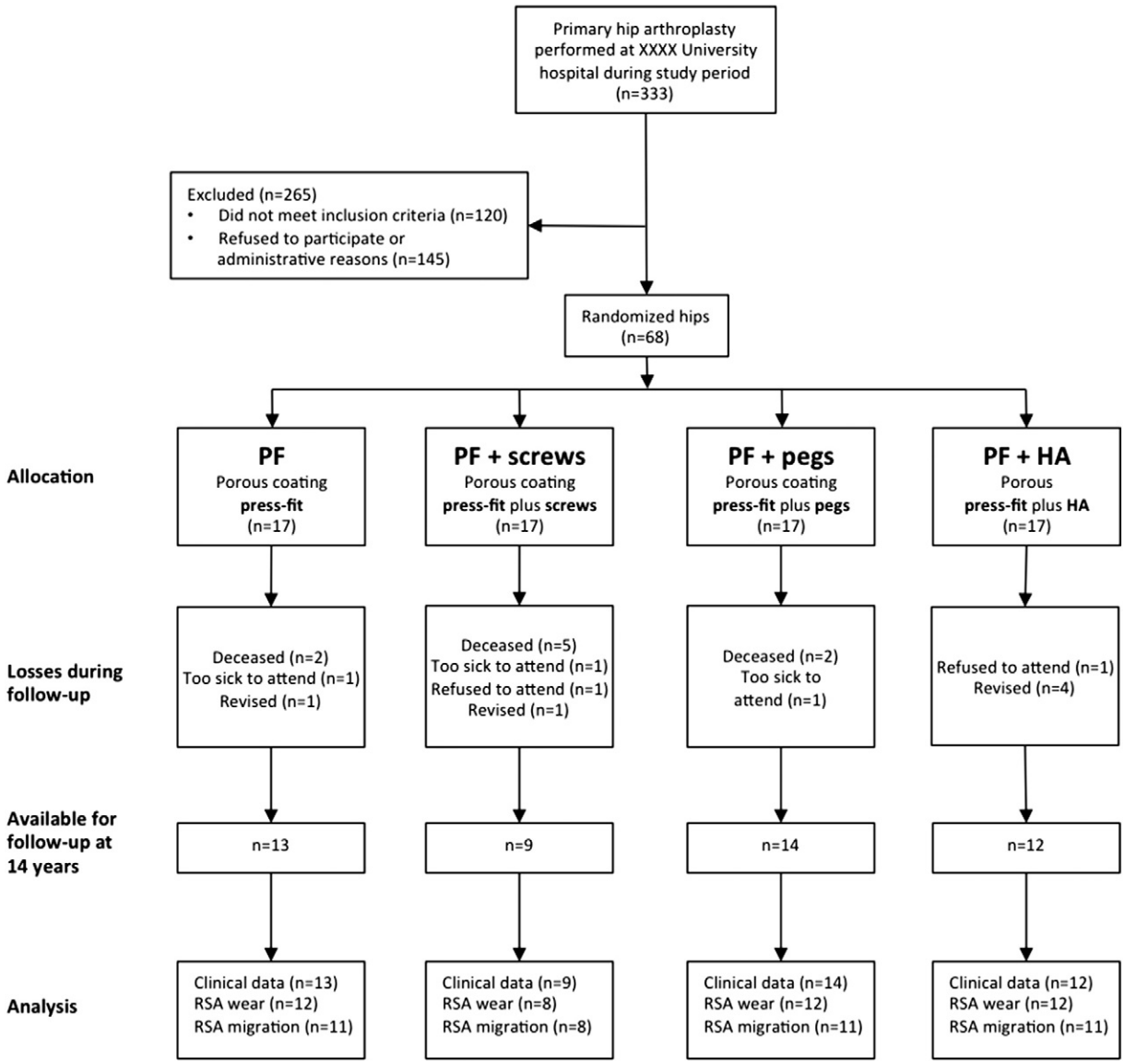

Fig. 1. Flow chart of study design.