

# Cemented or uncemented hemiprosthesis in the treatment of intracapsular femoral neck fractures in elderly

## Review of interesting publications from the 21st century

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Femoral neck fractures are common among elderly people. These fractures can cause significant changes in people's life and many patients never return to the same activity level. For the displaced femoral neck fracture in the elderly the standard surgical procedure has been hemiarthroplasty. It has been debated for years which method of fixation is the best, cementing the prosthesis or press-fit fixation without cement. There are only a handful of prospective studies comparing these two methods and in almost all of them the prostheses used are very old models: Austin-Moore (uncemented) and Thompson (cemented). In this article a selection of studies from the 21st century are presented; also two review articles and the latest updated version of the Cochrane review. The best fixation method for the femoral stem still remains unanswered.

Femoral neck fractures are common injuries among elderly people (1). It has been estimated that every year 6000 Finns fracture their hip for the first time. Of those about 62% are femoral neck fractures (2). A large proportion of fracture patients cannot return to prefracture activity level and 11% of previously ambulatory patients will not be able to walk independently after the fracture (3). One third of the patients die during the first postoperative year (4).

The most common treatment for a displaced femoral neck fracture in the elderly is hemiprosthesis. The hemiprosthesis is either cemented into the femoral canal or uncemented with press-fit technique. The most common fixation method of the femoral stem has been cementing with special bone cement. However, this method has some disadvantages. The duration of surgery is longer than in uncemented technique. Also blood loss is greater and there is a risk of sudden death at the time of cementing (5).

There is a long-standing debate on the superiority of the two methods. In the literature there have been some reviews, a Cochrane review and even some prospective randomized studies. The problem is that in most of these articles the prosthesis used has been

either Austin-Moore (uncemented) or Thompson (cemented). These prostheses are old fashioned and while widely used in some countries (e.g., in USA, UK, Northern Ireland), they are not comparable with modern prostheses. That is why the literature does not give good modern guidelines whether to cement or not the stem of the hemiprosthesis.

### *Aim*

The aim of this paper was to find out and present recently published reviews and articles comparing the outcome of patients after operation for a displaced femoral neck fracture with cemented or uncemented prosthesis.

### *Method*

The search was made in PubMed and Ovid databases from 2000 onwards and the most recent and/or the most interesting publications were chosen. The choice was made very subjectively and the chosen articles are presented here with the author's comments included.

## Review articles

Leighton et al. from Canada and USA have written an interesting review article in *Injury* 2007 in which they give guidelines of how to treat intracapsular hip fractures in elderly patients, i.e., in patients over 60 years of age (6). They have reviewed 53 articles and base their recommendations upon these articles and their own experience. In their conclusion they state that in the case of femoral neck fracture in a patient over 60 years of age following guidelines are supported by literature:

- In undisplaced, stable fractures, perform an ORIF.
- In displaced fractures, replace the head of the femur.
- The use of the Moore or Thompson prosthesis should be relegated to the medically infirm, minimally ambulatory patient.
- Modular unipolar or bipolar (cemented stem) hemiarthroplasty has the most reliable and predictable outcome in most patients.
- An uncemented stem should be considered in patients with significant cardiovascular risk factors.
- Total Hip Arthroplasty (THA) is being done more often in "active elderly patient".

Authors themselves use an uncemented stem also in patients with good bone quality and canal diameter of 16.5 mm or less. It is a difficult task to try to set guidelines on how to treat hip fracture patients optimally according to the literature, and Leighton et al. have done a good attempt to that subject.

Ahn et al. from USA published a systematic review dealing only with cemented and uncemented hemiarthroplasty outcomes in (7). They searched PubMed databases and Cochrane Library and found three RCT studies and eight retrospective cohort comparisons that met their criteria. All but one article they included were rather old: four were from 1982-1989, five from 1991-1994, one from 2000 and one from 2005.

They state that - as is often the case with systematic reviews - their results are limited by the availability and quality of available data, especially because of the high variability in and between the reports used. Despite the limitations they described very thoroughly, they offer some conclusions based on available data (though very limited). The trends that favor cementing in this review were middle- and long-term mortality,

overall complications, need for revision and postoperative pain. However, none of these observations were statistically significant. In uncemented operations surgical time and blood loss were lower than in cemented ones. Both these parameters were statistically significant. Most of the articles they presented had Austin-Moore and/or Thompson prosthesis as implants.

Parker et al. from UK have published the most recent version of Cochrane review (8) of "Arthroplasties for proximal femoral fractures in adults" last year 2010. They identified 23 RCTs. Seven studies compared cemented and uncemented prostheses. In those studies only one had other models than either Austin-Moore or Thompson in the study (9). This Cochrane review therefore gives data mainly on the results of Thompson and Austin-Moore hemiarthroplasties.

## Original papers comparing cemented and uncemented hemiarthroplasties

The only RCT published with modern implants is a study by Figved et al. from Ullevål Norway. They conducted a study of 223 patients comparing cemented Spectron prosthesis and uncemented hydroxyapatite coated Corail prosthesis (9). Their patients were from 2 hospitals, older than 70 years of age and had a displaced femoral neck fracture. 36 surgeons operated the patients with a median of 5 operations each. All the patients were treated according to the normal routine of the hospitals. Both of their prostheses are used in both fracture treatment and THA and are well documented. They used Harris Hip Score (10) to rate the function of the operated hip and their primary outcome was the HHS at 12 months. They also used Barthel Index (BI) to rate the ability to perform activities of daily living (11).

They found no differences in HHS or BI or EQ-5D (health-related quality of life index) between the groups. Mortality was reported to be at one year 29% with uncemented and 19% with cemented group ( $p=0.11$ ) and at 2 years 34% and 30%, respectively ( $p=0.56$ ). So the difference was not statistically significant but there was a trend of higher mortality in the uncemented group.

They discuss the role of modern implants in fracture treatment. They recommend the use of femoral stems that have been performing well in THAs. Both methods in this study showed equally good results and therefore they recommend both implants.

One thing that makes the study important is that

very many surgeons did the operations. That way the personal experience of the surgeon is not that important to the result. In other words the less skilled surgeons can also manage either of those operative methods.

Hansen et al. reported results of a retrospective analysis of 78 modern cemented and 97 modern uncemented, hydroxyapatite coated, hemiarthroplasties in their retrospective work from Denmark (12). They used cemented CPT (Zimmer) for the first 17 months and then uncemented Corail (DePuy) for the next 13 months. All patients during those time periods with those implants were included in their retrospective study. Their goal was to investigate if uncemented hydroxyapatite coated hemiprosthesis could be recommended for the displaced femoral neck fracture. Cemented prostheses were operated by 20 different surgeons and uncemented by 18. They compared complications, reoperations and mortality. They did not find any statistically significant difference between the groups. For dislocations and intraoperative fractures they had 2+1 patients in the cemented group and 3+4 patients in the uncemented group, respectively. In the cemented group they had 3 (out of 78) reoperations and in uncemented group 2 (97). 30-day mortality was 8% (6/78) in cemented and 7% (7/97) in uncemented group ( $p=0.91$ ). 3-month mortality was 10% (8/78) and 15% (15/97) respectively ( $p=0.31$ ), and 1-year mortality was 21% (16/78) and 25% (24/97) ( $p=0.51$ ). There was a trend towards higher mortality in the uncemented group, but again this was not statistically significant. In their conclusion they state that both these types of arthroplasties are good treatment options. Also further exploration of long term benefits and disadvantages of a hydroxyapatite-coated hemiarthroplasty to the treatment of displaced femoral neck fracture in elderly patients are needed.

The most recent RCT published is by Parker et al. They published a 400 patient prospective randomized controlled trial comparing cemented and uncemented hemiprosthesis (13). Even though the main author either operated or supervised the operation himself the study was well conducted, the protocol and the results in their study are clearly described and the discussion is relevant for everyday use. The weakness of the paper is that the prostheses studied are Austin-Moore and Thompson. In the discussion they explained that Austin-Moore and Thompson are still the most widely used prostheses in the UK (11,14). They also stated in the discussion the following: "It is possible that a mod-

ern uncemented prosthesis, perhaps with hydroxyapatite coating, may produce superior outcomes to the uncemented Austin-Moore prosthesis... this remains to be proved in randomized controlled trial".

An article comparing early (within 30 days of surgery) periprosthetic femoral fractures between cemented and uncemented hemiarthroplasties was published in *Injury* by Foster et al. in 2005 from Northern Ireland (15). In their retrospective analysis of 244 patients of which 70 patients had uncemented prosthesis, 7% (5/70) of patients with uncemented prosthesis suffered a periprosthetic fracture. Of those 2 were intraoperative and 3 occurred within 45 days after surgery. Four of the observed five fractures were treated operatively. No fractures were detected in the cemented group. Patient selection to receive either cemented or uncemented prosthesis was made by operative surgeon and anesthesiologist i.e. there was no randomization. Their normal policy was to cement the hemiprosthesis. Uncemented group was almost 4 years older than cemented group. The implants used were again Austin-Moore and Thompson. The conclusion of the authors was that cemented prosthesis is preferable for elderly patient with displaced femoral neck fracture. They also recognize the need for a prospective randomized study.

## Conclusions

All three review articles presented are interesting and the surgeons dealing with the issue of cementing or uncementing the hemiprosthesis should read especially the Cochrane review carefully. However these reviews do not give us information concerning the use of modern femoral stems, cemented or uncemented. This means that we cannot rely on these reviews when we think of modern prosthesis that we use today in Finland.

The only RCT with modern implants by Figved et al. (9) is an important starting point for future studies because it shows that with modern implants the results of uncemented hemiarthroplasty can be as good as with cemented ones. If this is also true in later studies, we have an additional option to treat our patients. This would be especially important for those very fragile patients with possibly greater risk of having problems during cementing the prosthesis. And maybe there is a subgroup of patients that do better with uncemented prosthesis that we still don't know yet.

When reading articles concerning cemented or

uncemented hemiarthroplasty for displaced femoral neck fracture, one should consider especially which implants are used. If very old-fashioned implants are used, the value of the study can be questioned. There is a surprisingly low number of controlled randomized studies of the subject considering the fact that displaced femoral neck fractures are common and the mortality and morbidity are high among these old patients. There are less than a handful of publications comparing these two methods with modern models of cemented and uncemented prosthesis, even though there are modern implants available. Today many modern implants that originally were designed for THA can be used for fracture treatment. Which implants are the most suitable remains open and more research is needed. Such studies are planned and one example is Anne JH Vochteloo and her colleagues' study comparing two modern implants from Zimmer and Biomet. Their study protocol is published in *BMC Musculoskeletal Disorders* 2009 (16). The Cochrane reviews will help to determine the most important methods and study outcomes when planning a new study.

Because modern femoral stems are available and in use for fracture treatment in many countries the results of these prostheses should be published. Even results of retrospective series of modern implants would be interesting, but especially prospective, randomized and controlled studies are needed. The studies should have sufficient number of patients to make the study-power great enough. Randomization, inclusion and exclusion criteria, treatment protocol, outcome measures and experience of surgeons should all be clearly defined. After such studies with long enough follow-up periods (at least 12 months, but preferably 24-48 months) are published, can we expect results that give us good guidelines for our work.

Maybe then we can better answer the question: Which one of the methods is better for our patient, cemented or uncemented?

### **Acknowledgements**

*I wish to thank professor Ilkka Kiviranta (Department of Orthopaedics and Traumatology, Helsinki University Central Hospital) for his comments on the manuscript.*

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