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## French Hip Resurfacing Registry: A Study of 1650 Cases

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## **ABSTRACT**

**Background:** Hip resurfacing has been the focus of many evaluations based on international registries but, to date, no prospective studies have evaluated this procedure in France. In 2015, the French Society for Orthopaedics and Traumatology (SoFCOT) and the French Hip and Knee Society concluded an agreement with the French Medicines Agency (ANSM) and French National Health Authority (HAS) to establish an exhaustive observational hip resurfacing registry. The primary objective of this study was to evaluate the hip resurfacing survival rate since the creation of the registry 5 years ago. The secondary objectives were to evaluate the clinical, functional, and radiological outcomes of hip resurfacing and to check the absence of specific complications related to this implant.

**Hypothesis:** The hypothesis was that the registry survival rate was below 0.5% per year.

**Methods:** Since 2015, data from all patients undergoing hip resurfacing were collected into a monitored database using the software suite OrthoWave. The following were collected for each patient: demographics, anthropometric characteristics, clinical parameters (Postel Merle d'Aubigné score, Harris Hip Score, Oxford Hip Score, and UCLA Activity Score), and radiological findings. Completeness of data collection was checked once a year.

**Results:** 1650 hip resurfacings in 1506 patients (1409 males and 97 females) with a mean age of 50.7 years (range, 17-70 years) were included. Mean follow-up was 3.8 years (range, 2-4.8 years). Mean completeness of data recording was 98.2%. All clinical scores improved significantly. Hip revision was required for 7 (0.4%) complications including 4 femoral neck fractures, 1 aseptic lymphocyte-dominant vasculitis-associated lesion with a large joint effusion, 1 femoral component loosening, and 1 delayed sepsis requiring bipolar removal. At 5 years, the survival rate without hip revision for any cause was 99.6% (95% confidence interval, 99.3%-100%).

**Discussion:** The short-term outcomes of patients in the French registry are encouraging in terms of complication and surgical revision rates. The near absence of complications related to metal-on-metal bearing surfaces demonstrates that the criteria used in France (at least 48 mm head diameter, use of implants for which long-term data are available, and specific training of surgeons) ensure successful long-term outcomes.

**Level of evidence:** II

**Key words:** hip resurfacing, registry, dislocation

## **INTRODUCTION**

Hip resurfacing (HR) has been the focus of many evaluations based on international registries established in other countries, but no prospective studies of hip resurfacing in France have been reported to date [1]. Consequently, in 2015 the National Professional Committee (NPC) of the French Society for Orthopaedic and Trauma Surgery (SoFCOT) concluded an agreement with the French Medicines Agency (ANSM) and French National Health Authority (HAS) to continue using this prosthetic option in stringently selected patients and to establish both an exhaustive national registry and an accredited training centre [2]. This centre offers practical training consisting, as proposed by the HAS and ANSM, in mentoring and supervising surgeons as they develop the necessary skills so that they can receive accreditation to practice hip resurfacing from the NPC-SoFCOT and the board of the French Hip and Knee Society (*Société Française de la Hanche et du Genou*, SFHG). Accreditation is renewed annually if surgeons follow the stringent patient selection criteria for hip resurfacing and participate in the exhaustive Hip Resurfacing Registry (HRR).

As with all registries, the HRR provides a multicentre cohort for prospective, non-comparative, single-arm, open-label studies of consecutive patients managed with hip replacement.

The primary objective of this study was to evaluate the survival rate of hip resurfacing since the creation of the registry 5 years ago. The secondary objectives were to evaluate the clinical, functional, and radiological outcomes and to assess specific complications of hip resurfacing implants. The working hypothesis was that the registry survival rate was below 0.5% per year.

## **MATERIAL AND METHODS**

In 2019, accreditations for HR were validated or renewed for 18 surgeons[2]. Each evaluating surgeon was to include consecutive patients (after obtaining their consent) into the registry. Data were entered into the electronic database monitored by the OrthoWave™ software suite[3] (software suite for studies and clinical follow-up of hip and knee arthroplasties; MediCowl group, Belmont-sur-Lausanne, Switzerland; Reported to the French Data Protection Authority [CNIL], #1207969 in 2007 with renewed approval in 2015, #1874942v0; accreditations MR001, MR003, and MR0042). The data were collected by the surgeon, a resident, or a clinical research assistant depending on usual practice at the surgical centre (private for 13 surgeons and in university hospitals<sup>2</sup> for 5 surgeons). The baseline clinical data were collected during the pre-operative visit and the follow-up data during visits after 2, 6, 12, and 24 months.

The following data were collected: demographics (age, sex, height, weight), characteristics of the surgical procedure (operative time, types of implants, surgical approach...), clinical scores before and after surgery (Postel Merle d'Aubigné [PMA] score[4], Harris Hip Score [HHS] [5], Oxford Hip Score [OHS] [6], UCLA Activity Score [7]), and radiological findings (cup inclination in the coronal plane and position of the femoral cup according to the pelvic teardrop [U-figure] on a standing antero-posterior pelvic radiograph).

The inclusion period was from the creation of the registry on 4 January 2015 to 31 December 2019.

## **Description of the devices used**

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<sup>2</sup>University hospitals in France are publicly funded.

At the time the HRR was created, two types of HR implants were available on the French market: Conserve+<sup>®</sup> (MicroPort<sup>™</sup>, Arlington, TN, USA) and BHR<sup>®</sup> (Smith & Nephew<sup>™</sup>, Leamington Spa, UK). The Conserve+<sup>®</sup> acetabular shell has a fixed low profile of 170° and a porous coating of titanium-hydroxyapatite plasma spray. The BHR<sup>®</sup> acetabular cup has a macro-porous structure with a single layer of microbeads coated with hydroxyapatite on the outer surface. All femoral caps were cemented. In 2018, MicroPort<sup>™</sup> decided to leave the European market and, since then, the BHR<sup>®</sup> has been the only available hip resurfacing implant in France. Importantly, only femoral caps with a diameter of 48 mm or more were implanted. The postero-lateral approach was used in all patients[8].

### **Verification of data completeness**

To check that all patients treated by HR were entered into the registry, the number of implants used at the accredited centres, determined from billings to the national health insurance system, was compared to the number of patients entered by each surgeon into the HRR. Taking into account the factors that might cause differences between these two numbers (implantation failure or billing at the end of one year for an implant used at the beginning of the next year, for instance), registration completeness was estimated at 90% or more. An effort to identify missing patients was made by calling patients and their families then, if no response was obtained, the usual doctors.

### **Statistical analysis**

The statistical analysis was performed by Aria Data Solutions (Santa Monica, CA, USA) using the R programme integrated into the OrthoWave<sup>™</sup> software suite, as well as XLStat<sup>™</sup> software (Addinsoft, Paris, France).

Demographic characteristics and pre-operative and peri-operative features were described as range, median, and mean $\pm$ SD for quantitative variables and as number (%) for qualitative variables. Implant revision rates were evaluated using the Kaplan-Meier method and reported with their 95% confidence intervals (95% CIs).

## RESULTS

At the end of the inclusion period, 1650 HR procedures performed in 1506 patients (1409 males and 97 females) were entered into the HRR. The data were complete for sex, side, and type of HR. Data were missing for age of 3 patients and cause in 5 patients (i.e., less than 0.2% of the HRR). The mean body mass index (BMI) was 26.5 kg/cm<sup>2</sup> (15-46), mean height was 178 cm (156-208), and mean body weight was 83.8 kg (45-145). The mean age at surgery was 50.7 years (17-70 ([fig 1](#))). The American Society of Anesthesiologists score was 1 in 82.2% of patients, 2 in 17.2%, and 3 in 0.6%.

The distribution between sides was evenly balanced (left, 51% and right, 49%). Primary hip osteoarthritis was by far the most common cause (91.6%), followed by dysplasia (2.6%), trauma (2.4%), avascular necrosis of the femoral head (1.8%), and other causes (1.6%). The BHR implant was used in 622 (37.7%) cases and the Conserve+ implant in 1028 (63.3%) cases. Table 1 reports the implant diameters.

Completeness of data ranged across surgeons from 98.1% to 100% (mean, 98.7%). During the study period, 1678 implants were billed, i.e., 28 (1.7%) more than were included in the HRR. This small number was chiefly ascribable to the use in some patients of two acetabular cups (for instance, in the event of malposition or poor primary fixation, a second cup was used to avoid damaging the metal). At last follow-up, 2 (0.12%) patients had died

and 1 (0.06%) had been lost to follow-up. The mean time to the last clinical evaluation was  $3.8 \pm 0.58$  years (2-4.8).

Table 2 reports the clinical score values. At last follow-up after more than 3 years, the PMA score, HHS, and OHS were available for 1408, 1484, and 1450 HR procedures, respectively. The HHS increased from 48.9 before surgery to 96.9 at last follow-up, i.e., by a mean of 47.3. The global PMA score increased by 6.8 (from 10.6 to 17.4) and the OHS by 23.9 (from 38.2 to 62.1). The UCLA Activity Score improved significantly ( $p < 0.001$ ) (Table 3). The mean inclination of the cup in the coronal plane was  $42.4^\circ$  (29-62) and was less than  $45^\circ$  for 83% of cups.

HR revision with conversion to total hip arthroplasty (THA) was required in 7 (0.4%) cases, due to a femoral neck fracture (n=4), aseptic lymphocyte-dominant vasculitis-associated lesions (ALVAL) (n=1), femoral component loosening (n=1), and delayed sepsis requiring removal of both components (n=1). Of the 4 fractures, 3 were attributable to a technical error with notching of the femoral neck. The case of ALVAL occurred in a 56-year-old male (BMI, 27.7) with a Conserve+ implant (diameter, 50 mm). Two years after surgery, he experienced groin pain with a large effusion responsible for herniation of the ilio-tibial band. Cup inclination was  $51^\circ$  and the effusion aspirate yielded negative bacteriological results.

Surgical revision without implant removal was required in 14 (0.8%) cases for the following reasons: haematoma evacuation, n=6; infection successfully treated by lavage and antibiotic therapy, n=5; arthroscopic ilio-psoas tenotomy, n=2; and internal fixation of a post-traumatic trochanteric femoral fracture, n=1 (fig 2 and 3).

Other complications consisted of pulmonary embolus in 1 case with a favourable outcome, infiltration of the ilio-psoas muscle documented by computed tomography in 1 case,

a transient common fibular nerve deficit followed by a full recovery in 2 cases, and non-recurrent dislocation due to a high-energy trauma in 1 case.

Implant revision was not significantly associated with sex ( $p=0.6$ ), type of implant ( $p=0.2$ ), cup inclination ( $p=0.5$ ), or implant diameter ( $p=0.9$ ). No risk factors for femoral neck fracture were identified.

After 5 years of follow-up, the survival rate with HR revision for any reason as the endpoint was 99.6% (95%CI, 99.3-100 (fig 4)).

## **DISCUSSION**

This first evaluation 5 years after the creation of the French HRR shows excellent clinical outcomes and a high survival rate. The initial targets for HR outcomes set out by the supervisory authorities (SOFCOT and SFHG) seem to have been met, thanks to the specific training of the surgeons and selection of the HR implants that have been proven reliable over time, as well as to the requirement of a femoral cap diameter of 48 mm or more. This exhaustive French HRR deserves credit as an endeavour that benefits our orthopaedic community by allowing objective evaluations based on indisputably sound data about implantable medical devices.

The strengths of this work are those shared by all exhaustive nationwide registries, namely, the inclusion of all procedures whether they were performed in private or public healthcare facilities. Furthermore, the very high inclusion and follow-up rates indicate that the results are reliable and provide an accurate picture of reality. Compared to other national registries, we collected clinical scores, radiological data, and biological data allowing an evaluation of the functional outcomes and bearing-surface function.

A limitation of our study is the still relatively small number of cases, which does not allow a meaningful nationwide comparison with THA. However, as all cases of HR are included, such a comparison will become possible in the future. Follow-up was fairly short, with only mid-term data being reported and long-term outcomes remaining unknown. However, the goal of this work was to report short-term data to ensure that no alarm signals were emerging regarding the surgical revision rate.

In France, HR is still rarely used to treat incapacitating hip osteoarthritis. However, the population of patients meeting criteria for HR is relatively small (primary hip osteoarthritis in a young patient with a good-quality femoral head measuring at least 48 mm in diameter)[9-11]. Maravic et al.[1] evaluated 73 150 patients treated surgically in France for hip osteoarthritis. Extrapolating their data to the current number of THA procedures (150 000/year) indicates that about 6300 arthroplasties are performed in patients younger than 50 years [12]. Nevertheless, given the absence of a French THA registry, the proportion of these patients managed by HR is unknown.

HR was used for about 1% of hip arthroplasties in the registries for England and Wales, New Zealand, Norway, Sweden, Australia, and the US [13]. The highest proportion is 3.1% in Australia [1]. In the target population for HR, the BHR and Conserve+ implants produced satisfactory outcomes with revision rates of about 3% after 5 years (Table 4). With the BHR, in centres that did not participate in designing the implant, 5-year survival rates were 98.8% in a study by Oak et al. [14] and 97.2% in another by Ford et al. [15]; corresponding values for the Conserve+ were 95% [16-17] and 98.7% [18]. The Australian registry data on the BHR for 2019 indicate a 5-year revision rate of 3.5% (3.1-3.8) [19]. The UK registry has 39 246 cases of HR (for all implant types pooled) and 3-year and 5-year revision rates of 3.01% (2.84-3.19) and 5.5% (5-5.54), respectively [20]. With the BHR, the 3-year and 5-year revision rates in the UK registry are 2.3% (2.1-2.6) and 3.6% (3.4-3.9), respectively.

The requirement of an implant diameter of 48 mm or more is used only in France and makes a major contribution to the excellent outcomes in our study. In the UK and Australian registries, the revision rate is 4-fold higher when the diameter is less than 44 mm [13,19-20]. Confining the analysis to diameters of 48 mm or more yields a 2.2% (1.9-2.) compared to 4.8% (3.8-5.1) for the smallest diameters after 7 years of follow-up. Using only femoral implants of at least 48 mm in diameter ensures that the femoral bone stock is consequential, which predicts a low risk of femoral aseptic loosening. In addition, a large diameter of the acetabular cup is a major factor in limiting the risk of an adverse reaction to metal debris (ARMD) [21]. The larger the cup diameters, the greater the contact patch-to-rim distance, which allows continuous lubrication, thereby ensuring optimal function of the friction couple [21]. Thus, the HRR has a single case of ARMD (secondary to implant malposition with an excessively vertical cup) and the absence of impaired metal-on-metal function.

In the Nordic registry, the outcomes of HR correlate significantly with surgeon experience, notably the number of HR procedures performed by the surgeon [22]. Thus, experienced centres with trained surgeons had a 2-year survival rate of 98.8% compared to 91.5% in low-volume centres. Our results also make a strong case for creating a specific training programme for HR, since this surgical technique is not taught in most French university centres. The learning curve is thus significantly shortened, making surgical complications such as femoral neck fracture (0.24%) extremely uncommon. Nunley et al. [23] evaluated the learning curves for 650 HR procedures and found an overall femoral neck fracture rate of 0.5%, with all these fractures occurring among the first 25 procedures performed by each surgeon. Similarly, the complication rate was 5.6% for the first 25 cases and 1.6% subsequently.

Another important lesson taught by our study is that a registry that generates important data capable of significantly improving the evaluation of arthroplasties can be established

over a short time period. In addition to providing short-term data, the registry allows the evaluation of long-term outcomes and implant survival, as well as comparisons according to numerous criteria (sex, activity, implant type ...). The registry can serve as an early alarm system for detecting failed implants [24].

The data completeness rate above 98% reflect the high degree of involvement of all participants. This investment must be maintained over time to allow relevant assessments of long-term outcomes. For comparison, the SoFCOT arthroplasty registry includes about 6000 procedures each year, i.e., about 3% of the number performed nationwide, and is thus very far from being exhaustive. This poor representativity can be ascribed to surgeons not being in the habit of including patients and to the absence of a mandate to include [25].

## **CONCLUSION**

The short-term outcomes in the HRR are extremely encouraging in terms of complications and surgical revision rates. They confirm the valuable contribution of this treatment option in young and active patients with hip osteoarthritis, notably in drastically reducing the instability rate. The near absence of complications related to the metal-on-metal bearing surface after a mean follow-up of 3.8 years demonstrates that the French requirements (prosthetic head measuring at least 48 mm in diameter, implants with long follow-up data, and specially trained surgeons) seem judicious. Longer term results must now be obtained to confirm our initial findings.

### **Conflicts of interest**

JG is a consultant for Smith & Nephew and for Corin. None of the other authors has any conflicts of interest to declare.

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None

## **Contributions of each author**

JG contributed to develop the study methodology and wrote the manuscript.

JAE contributed to develop the study methodology and performed the statistical analysis.

PM contributed to collect the study data and revised the manuscript for important intellectual content.

JD contributed to collect the study data and revised the manuscript for important intellectual content.

## References

1. Maravic M, Landais P. Usefulness of a national hospital database to evaluate the burden of primary joint replacement for coxarthrosis and gonarthrosis in patients aged over 40 years. *Ost Cart*. 2006;14:612-5.
2. <https://www.sfhg.fr/accueil/resurfa%C3%A7age-de-hanche/> (accessed in July 2020)
3. Epinette JA. Outcome Studies in Hip and Knee Arthroplasty: A 14-Year experience with the OrthoWave Software suite. *Orthopaedic Proceedings* 2018; 94: Supp XXV ([http://www.bjjprocs.boneandjoint.org.uk/content/94-B/SUPP\\_XXV/63](http://www.bjjprocs.boneandjoint.org.uk/content/94-B/SUPP_XXV/63)).
4. Merle D'Aubigné R. Numerical classification of the function of the hip. *Rev Chir Orthop Reparatrice Appar Mot* 1990 76:371-4.
5. Harris WH, McCarthy JC, O'Neill DA. Femoral component loosening using contemporary techniques of femoral cement fixation. *J Bone Joint Surg Am* 1982 64:1063-7.
6. Delaunay C, Epinette JA, Dawson J, et al. Cross-cultural adaptations of the Oxford 12 hip score to the French speaking population. *Orthop Traumatol Surg Res* 2009 95:89-99.
7. Zahiri CA, Schmalzried TP, Szuszczewicz ES, Amstutz HC. Assessing activity in joint replacement patients. *J Arthroplasty* 1998 13:890-5.
8. Girard J. Le resurfaçage de hanche. Technique chirurgicale. *Orthopédie-Traumatologie. Encyclopédie Médico-Chirurgicale*. Ed Elsevier Masson SAS (Paris) 2013, 44-460.
9. Martinot P, Dartus J, Putman S, Girard J. Return to work after hip resurfacing. *Orthop Trauma Surg Res* 2020 106:1507-10.
10. Common H, Rousseau R, Putmans S, Putman S, Girard J. High level judo practice after hip resurfacing. *Orthop Trauma Surg Res* 2020 106:1575-80.

11. Maillot C, Auvinet E, Harman C, Cobb J, Riviere C. Hip resurfacing generates a more physiological gait than total hip replacement: a case-control study. *Orthop Trauma Surg Res* 2020 106:527-34.
12. Erivan R, Vilatte G, Dartus J, Reina N, Descamps S, Boisgard S. Progression and projection for hip surgery in France, 2008-2070 ; epidemiologic study with trend and projection analysis. *Orthop Traumatol Surg Res* 2019 105:1227-35.
13. Heckmann N, Hansellhn N, Stefl M, Etkin CD, Bryan D, Springer B, Berry DJ Lieberman JR. Early Results From the American Joint Replacement Registry: A Comparison With Other National Registries. *J Arthro.* 2019 34:S125-34.
14. Oak SR, Strnad GJ, O'Rourke C, Higuera CA, Spind L. Mid-Term Results and Predictors of Patient-Reported Outcomes of Birmingham Hip Resurfacing. *J Arthroplasty.* 2017 32:110-118
15. Ford MC, Hellman MD, Kazarian GS, Clohisy JC, Nunley RM, Barrack RL. Five to Ten-Year Results of the Birmingham Hip Resurfacing Implant in the U.S.: A Single Institution's Experience. *J Bone Joint Surg Am.* 2018 100:1879-87.
16. Somers JF, Vanbiervliet J, Lefevere F. Results of Conserve Plus Hip Resurfacing: prospective clinical, radiographic and ion study. *Acta Orthop Belg.* 2015 81:413-9.
17. Zylberberg AD, Nishiwaki T, Kim PR, Beaulé PE. Clinical results of the conserve plus metal on metal hip resurfacing: an independent series. *J Arthroplasty.* 2015 30:68-73.
18. Girard J, Lons A, Ramdane N, Putman S. Hip resurfacing before 50 years of age: A prospective study of 979 hips with a mean follow-up of 5.1years. *Orthop Traumatol Surg Res.* 2018 104:295-9.
19. <https://aoanjrr.sahmri.com/documents/10180/689619/Hip%2C+Knee+%26+Shoulder+Arthroplasty+New/6a07a3b8-8767-06cf-9069-d165dc9baca7> (accessed in July 2020)

20. <https://reports.njrcentre.org.uk/Portals/0/PDFdownloads/NJR%2016th%20Annual%20Report%202019.pdf> (accessed in June 2020)
21. Yoon JP, Le Duff MJ, Johnson AJ, Takamura KM, Ebrahimzadeh E, Amstutz HC. Contact Patch to Rim Distance Predicts Metal Ion Levels in Hip Resurfacing. *Clin Orthop Relat Res.* 2013 471:1615-21.
22. Johanson PE, Fenstad AM, Furnes O, Garellick G, Havelin LI, Overgaard S, Pedersen AB, Kärrholm J. Inferior outcome after hip resurfacing arthroplasty than after conventional arthroplasty. Evidence from the Nordic Arthroplasty Register Association (NARA) database, 1995 to 2007. *Acta Orthop.* 2010 81:535-41.
23. Nunley RM, Zhu J, Brooks PJ, Engh Jr. CA, Raterman SJ, Rogerson JS, Barrack RL. The Learning Curve for Adopting Hip Resurfacing Among Hip Specialists. *Clin Orthop Relat Res* 2010 468:382-91.
24. <http://www.swissorthopaedics.ch/images/content/SIRIS/KurzfassungF.pdf> (accessed in July 2020)
25. <https://sofcot.memdoc.org/>. (accessed in March 2020)

## **FIGURE LEGENDS**

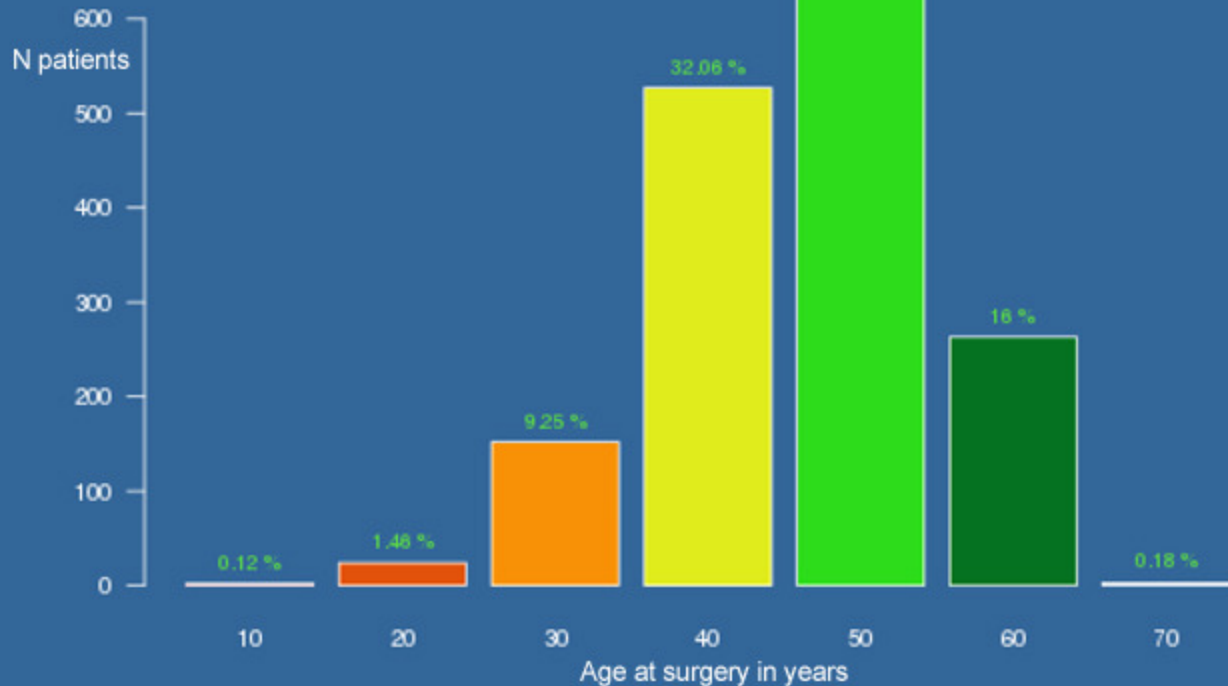
**Figure 1:** Age group distribution at the time of hip resurfacing

**Figure 2.** Computed tomography of a trochanteric fracture that occurred 3 years after hip resurfacing due to a fall from a bicycle with direct impact on the hip in a patient who cycled 12 000 km/year. There is no evidence of implant loosening.

**Figure 3.** Same patient as in Figure 1. The fracture was managed by internal plate fixation. Radiograph taken 4 years after hip resurfacing showing healing of the fracture with an excellent clinical outcome (PMA score, 6/6/6) and a return to cycling.

**Figure 4:** Survival curve with surgical revision of the hip resurfacing for any reason as the endpoint. Survival after 5 years was 99.6% (95% confidence interval, 99.3%-100%).

## AGE DISTRIBUTION AT SURGERY



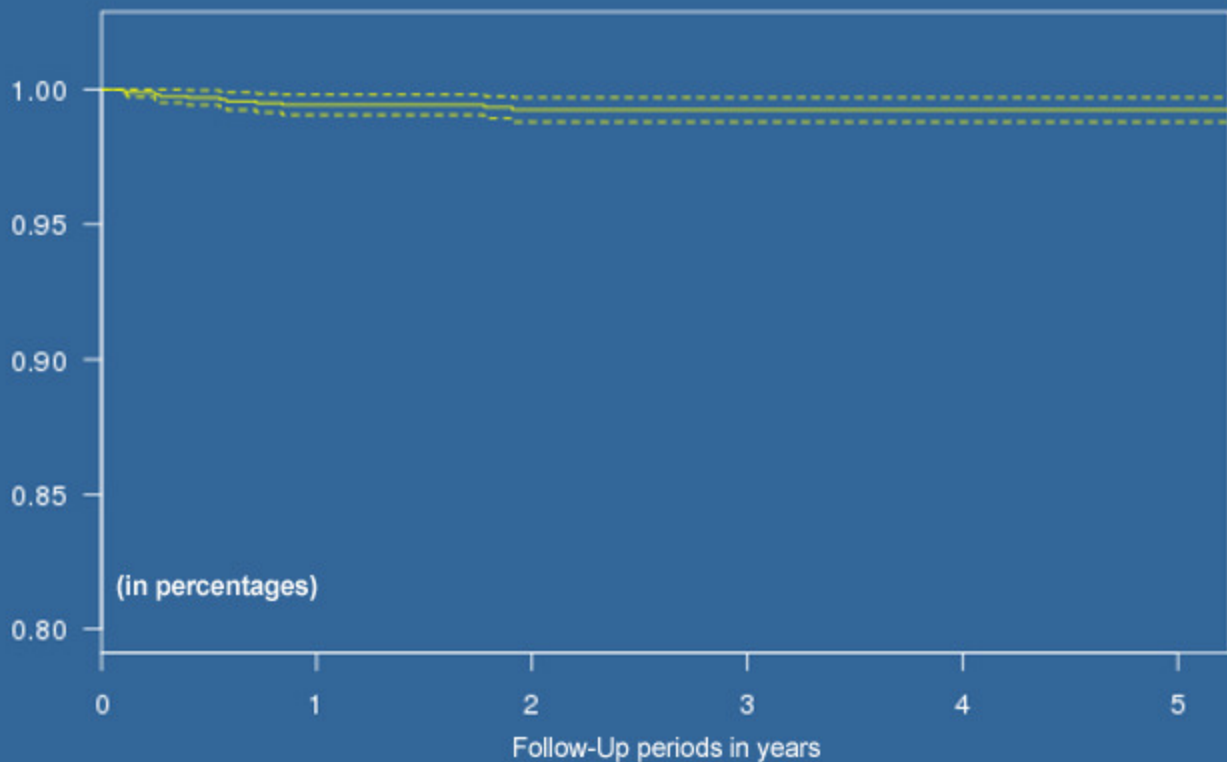


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## SURVIVORSHIP ANALYSIS ACCORDING TO KAPLAN-MEIER



**Table 1.** Diameters of the femoral and acetabular implants used for 1573 hip resurfacing procedures

Diameter femoral and (acetabular) implant, mm	Number of cases (%)
48 (54)	219 (13.2%)
50 (56)	312 (18.9%)
52 (58)	394 (23.9%)
54 (60)	402 (24.4%)
56 (62)	255 (15.5%)
58 (64)	60 (3.6%)
60 (66)	5 (0.3%)
62 (68)	3 (0.2%)

**Table 2. Changes in the Postel-Merle d'Aubigné score, Harris Hip Score, and Oxford Hip Score from before surgery to last follow-up. The data are mean (range).**

	Before surgery	At last follow-up	<i>p</i> value
Global HHS	48.9 (15-74)	97 (47-100)	<0.0001
HHS pain	24.2 (0-34)	42.2 (10-44)	<0.05
HHS function	20.8 (0-39)	45.9 (28-47)	<0.05
HHS mobility	2.4 (0-4)	3.9 (0-4)	<0.05
Global PMA score	10.6 (4-18)	17.5 (11-18)	<0.0001
PMA pain	1.5 (0-6)	5.7 (1-6)	<0.05
PMA mobility	4.9 (1-6)	5.9 (4-6)	<0.05
PMA ability to walk	4.3 (1-6)	5.8 (5-6)	<0.05
OHS	38.2 (21-58)	14.3 (12-44)	<0.0001

HHS, Harris Hip Score; PMA, Postel-Merle d'Aubigné; OHS, Oxford Hip Score

**Table 3. Change in the UCLA Activity Score from before surgery to last follow-up**

UCLA items	Before surgery, %	At last FU, %
Dependent	11.8	2.3
Mild-to-moderate activities	41.6	18.7
Active sports – not strenuous	23.6	35.6
Strenuous sports	22.6	43.0

UCLA, University of California, Los Angeles; FU, follow-up

**Table 4.** Previously published studies of the hip resurfacing implants used in France with follow-up durations similar to that in our study

	Implant	Number of cases	Follow-up, years	Survival, %
Oak et al. (9)	BHR	541	6.2	98.8%
Ford et al. (10)	BHR	360	5	97.2%
Girard et al. (13)	C+	979	10	98.7%
Somers et al. (11)	C+	42	5	95%
Zylberberg et al. (12)	C+	548	6.6	94.5%
Australian registry (14)	BHR	11 782	5	96.5%
UK registry (15)	BHR	22 572	5	96.4%
Our cohort	BHR and C+	1650	3.8	99.6%