



■ HIP

Uncemented total hip arthroplasty can be used safely in the elderly population

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Aims

"Get It Right First Time" (GIRFT) and NHS England's Best Practice Tariff (BPT) have published directives advising that patients over the ages of 65 (GIRFT) and 69 years (BPT) receiving total hip arthroplasty (THA) should receive cemented implants and have brought in financial penalties if this policy is not observed. Despite this, worldwide, uncemented component use has increased, a situation described as a 'paradox'. GIRFT and BPT do, however, acknowledge more data are required to support this edict with current policies based on the National Joint Registry survivorship and implant costs.

Methods

This study compares THA outcomes for over 1,000 uncemented Corail/Pinnacle constructs used in all age groups/patient frailty, under one surgeon, with identical pre- and postoperative pathways over a nine-year period with mean follow-up of five years and two months (range: nine months to nine years and nine months). Implant information, survivorship, and regular postoperative Oxford Hip Scores (OHS) were collected and two comparisons undertaken: a comparison of those aged over 65 years with those 65 and under and a second comparison of those aged 70 years and over with those aged under 70.

Results

Overall revision rate was 1.3% (13/1,004). A greater number of revisions were undertaken in those aged over 65 years, but numbers were small and did not reach significance. The majority of revisions were implant-independent. Single component analysis revealed a 99.9% and 99.6% survival for the uncemented cup and femoral component, respectively. Mean patient-reported outcome measures (PROMs) improvement for all ages outperformed the national PROMs and a significantly greater proportion of those aged over 65/69 years reached and maintained a meaningful improvement in their OHS earlier than their younger counterparts ($p < 0.05/0.01$ respectively).

Conclusion

This study confirms that this uncemented THA system can be used safely and effectively in patient groups aged over 65 years and those over 69 years, with low complication and revision rates.

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Introduction

In the UK, since the publication of the 2015 'Getting It Right First Time' (GIRFT) report,¹ there has been significant pressure for orthopaedic surgeons to use cemented hip implants in patients aged over 65 years because of perceived greater implant survival and lower costs. Following this, NHS England's 'Best Practice Tariff' (BPT) directive now requires 80% of total hip arthroplasty (THA) be cemented or hybrid, for

those patients aged 70 years or over, with financial penalties if this is not achieved.² A more recent update from GIRFT³ has advised BPT should even 'go further' advising 80% of THA be fully cemented for patients aged 70 years or over, stating "all evidence from the NJR supports this" and "the drift to uncemented in this age group is working against the evidence."¹

Both GIRFT and BPT do, however, acknowledge that more data/trials are

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required to confirm their policies or, alternatively, allow local variation,^{1,2} while the National Joint Registry (NJR) emphasizes “implant survivorship is only one measure of success.”⁴ Surprisingly, despite this considerable pressure to use cement, worldwide there has been an increase rather than decrease in uncemented THA.⁵ To understand this paradox, some studies have confirmed excellent long-term results for uncemented THAs.⁶⁻⁸ Furthermore cemented constructs are recognized as disappointing in younger and particularly active patients,^{4,9} in whom GIRFT and BPT support cementless THA.^{1,2} Finally, the added modularity of cementless devices (and without need for cement extraction) may lower the threshold to undertake revision surgery,⁹ skewing registry revision rates.

Interestingly, the National Institute for Health and Care Excellence (NICE) has not been so prescriptive in favouring cemented implants,^{10,11} advising simply that any implant should demonstrate a 95% ten-year survival and without reference to the mode of fixation. However, they acknowledge that a greater understanding of THA failure is required to identify those ‘prosthesis dependent’ and ‘prosthesis independent’¹⁰ and a more thorough investigation of patient-reported outcome measures (PROMs) to identify implant failure in patients who chose not to or are unable to undergo revision surgery.

The aim of our study was firstly to document accurately, prospectively collected data, for a large number of patients undergoing cementless THAs of all ages. Once collected, a comparison made of those patients aged over 65 years with those 65 and under (GIRFT recommendation),¹ and then another comparison for those aged 70 or above and again compared to their younger counterparts (BPT and GIRFT update).^{2,3} Results are then discussed in relation to the GIRFT¹ and BPT² recommendations and specifically fulfils their requests for more detailed information to support or refute a policy of cemented fixation in the elderly.

Methods

Using a prospectively collected single surgeon database, all patients requiring primary THA were considered for inclusion. Authorization to conduct the evaluation was received from Research and Development Department of the University Health Board. All individual records were anonymized before analysis. In total 1,091 primary THA constructs, involving patients of all ages (23 to 93 years old) and frailty from June 2010 until July 2019 (nine years) were identified.

The uncemented Corail/Pinnacle (DePuy Synthes, USA) THA system was used as the principle primary device. Details of any patients excluded from study preoperatively are included in Table I and any patient found intraoperatively unsuitable is documented in Table II.

Table I. Study exclusions: primary total hip arthroplasty with planned preoperative exclusion/alternative hip system.

Reason	Total, n
Acute neck of femur fracture	28
Previous/failed dynamic hip screw	14
Previous/failed cannulated screws	11
Failed intramedullary nail	4
Malignancy	11
Hip resurfacing	4
Previous column fracture ORIF	4
Blade plate in situ	2
Fibrous dysplasia	1
Previous acetabulum radiotherapy	1
Severe proximal femoral deformity (post trauma)	1
Previous osteomyelitis	1
High BMI and chronic severe kyphosis	1
Total	83

ORIF, open reduction, internal fixation.

Table II. Primary total hip arthroplasty with intraoperative required abandonment of Corail/Pinnacle system.

Case	Age, yrs	Implant abandoned	Implant used	Reason
1	45	Corail stem	Cemented Exeter	Femoral dysplasia with overhanging GT, unsuitable for Corail system
2	68	Corail stem	Cemented Exeter	Wide Dorr C canal, poor fit at size 16
3	74	Corail stem	Cemented Exeter	Insufficient offset, 50 mm Exeter used
4	77	Pinnacle cup, Corail stem	Cemented Exeter, uncemented Trident cup	Possible contamination of Corail preparation tray, alternative system used

All procedures were undertaken by the senior author (PML) or by trainees under direct, surgically scrubbed supervision. Each patient’s management pre- and post-operatively followed the same protocol with identical follow-up. Any management changes occurring during the study were kept to a minimum and documented. These included enhanced recovery and routine use of tranexamic acid, as detailed in a previous publication.¹² For bilateral THA, each procedure was undertaken separately and each THA analyzed individually.

PROMs, using the Oxford Hip Score (OHS), were recorded immediately preoperatively and postoperatively at six weeks, 4.5 months, one year, and finally at two years. Plain anteroposterior (AP) radiographs were obtained at each visit beyond the six-week appointment. At discharge, all patients were offered open access to the senior author’s (PML) arthroplasty clinic if required.

At conception, this study anticipated recruitment of 1,000 patients with detailed review at a minimum of one year (planned closure July 2020). However, with the COVID-19 crisis, it was decided to change this ‘end point’ to April 2020, thus providing a minimum and

Table III. Complications.

Variable	Total (%)	≤ 65	> 65	p-value	< 70	≥ 70	p-value
n	1,004	430	574		597	407	
NJR notifiable							
Revision, n (%)							
DAIR	7 (0.7)	1	6		4	3	
Revision for dislocation	3 (0.3)	1	2		2	1	
Traumatic periprosthetic fracture	3 (0.3)		3		1	2	
Total	13 (1.3)	2 (0.5)	11 (1.9)	0.382	7 (1.2)	6(1.5)	0.871
Re-revision, n (%)							
Aseptic loosening femoral component (previous DAIR)	1 (0.1)		1		1		
Death within 90 days, n (%)	3 (0.3)	1 (0.2)	2 (0.3)		1 (0.2)	2 (0.5)	
Non NJR notifiable							
Intraoperative*, n (%)							
Calcar crack and cable	10 (1.0)	4	6		6	4	
GT fracture and cable	1 (0.1)		1			1	
Postoperative, n (%)							
Transient fem nerve palsy	1 (0.1)	1			1		
Community cardiac arrest	1 (0.1)	1			1		
Dislocation × 1	6 (0.6)	2	4 (1 open reduction)		4	2 (1 open reduction)	
Dislocation × 2	1 (0.1)		1			1	
Dislocation × 3	1 (0.1)		1			1	
Irreducible dislocation	1 (0.1)		1			1	
(All dislocation including revision)	12 (1.2)	3	9	0.892	6	6	0.968
Traumatic PP fracture (conservative)	5 (0.5)	1	4		2	3	
ORIF B1 fracture	2 (0.2)		2			2	
(All postop fractures including revision)	10 (1.0)	1	9	0.801	3	7	0.856
(All operative fractures, B1 and B2)	5 (0.5)		5		1	4	
Postop myocardial infarction	1 (0.1)		1			1	
Postop pulmonary embolus	1 (0.1)		1			1	
Aseptic loosening femoral component (surveillance)	1 (0.1)		1			1	
Total non-notifiable	32 (3.2)	9	23	0.204	14	18	0.861
All complications	48 (4.8)	12/430	36/574	0.802	23/597	25/407	0.856

*MDS recorded but not published.

DAIR, debridement, antibiotics, and implant retention; GT, greater trochanter; NJR, National Joint Registry; ORIF, open reduction, internal fixation.; PP, periprosthetic

maximum follow-up of nine months and nine years and nine months, respectively (mean follow-up of five years and two months).

All patients received the Pinnacle Sector primary cup. There was, however, an expansion to the portfolio of Corail femoral component offsets and collared options, but any changes were minimal and documented (Supplementary Table i).

Each patient underwent preoperative templating. The acetabulum was reamed/implanted via a posterior approach with screw augmentation only for any concern of fixation. Head size was predominantly determined from the acetabular component aiming for a minimum of 6 mm of polyethylene. Exceptions were made in low-demand patients, where stability was favoured over polyethylene thickness. Following femoral preparation/trial reduction, each femur was calcar reamed and femoral component size rechecked for rotational stability. Each

bearing consisted of a lipped Marathon crossed-linked polyethylene liner (DePuy Synthes) with either a metal or ceramic head.

At study conclusion, overall cohort analysis was undertaken and compared with registry data. Two further comparisons were then made, firstly comparing patients over 65 years of age (GIRFT) and secondly those aged 70 and over (BPT), with their respective younger counterparts. Adverse events were recorded in detail (Table III), and implant failure recorded as per current NJR notifiable revision procedures (MDSv7.0 H1 v2.0, NJR).¹³ Once completed, a more comprehensive review was undertaken for any return to theatre or complication even without implant revision. This information, retrieved from the prospective database, was cross-referenced with consultant-specific NJR reports. No additional revisions or 90-day mortality was identified from the NJR. Long-term mortality was identified via the Welsh Clinical Portal and Myrddin Patient Informatic Service.

Table IVA. Revision procedures. Hip 'Independent' revisions: DAIR procedures.

Patient	Age at primary	BMI	Time index to DAIR	Time since DAIR	Reason for DAIR/comments	Picked up at routine follow-up?
1	61	47	19 days	3 yrs, 1 month	Persistent wound ooze, positive DAIR cultures	No
2	66	43	21 days	3 yrs, 4 mths	Persistent wound ooze, positive DAIR cultures	No
3	67	42	28 days	6 yrs, 6 mths then re-revision*	Haematoma evacuation, persistent wound ooze, secondary DAIR, positive DAIR cultures	No
4	68	23	21 days	6 yrs, 0 mths	Readmission with late presenting wound ooze, positive DAIR cultures	No
5	70	33	23 days	1 yrs, 10 mths	Persistent wound ooze, positive DAIR cultures on enrichment only	No
6	73	33	22 days	3 yrs, 10 mths	Fall and haematoma with persistent wound ooze, positive DAIR cultures.	No
7	78	26	4 yrs 10 mths	4 yrs, 8 mths	Acute late haematogenous infection, <i>Staphylococcus aureus</i> on DAIR cultures.	No

DAIR, debridement, antibiotics, and implant retention

Table IVB. Hip dependent revisions.

Patient	Age at primary	Time index to revision	Diagnosis	Comments	Picked up at routine follow-up?
Revision					
1.	59	3 yrs, 7 mths	3 × dislocation	Bearing exchange	No
2.	67	1 yr 6 mths	3 × dislocation	Bearing exchange	No
3.	68	2 yrs, 2 mths	Traumatic B2 fracture	Size 14 high offset femoral component, dementia, revision to long femoral component, cup retained	No
4.	71	1 yr 2 mths	3 × dislocation, failed final MUA	Rheumatoid arthritis, extensive bone loss prior to primary, revision to constrained liner.	No
5.	77	5 yrs, 3 mths	Traumatic B2 fracture	Size 16 high offset femoral component, dementia, revision to long femoral component, cup retained	No
6.	84	9 mths	Traumatic B2 fracture	Size 11 high offset femoral component, revision to long femoral component, cup retained.	No
Re-revision					
1.	67	6 yrs 7 mths	Previous DAIR, aseptic femoral component subsidence.	Size 12 high offset femoral component, single stage revision of all components (no growth)	No

DAIR, debridement, antibiotics, and implant retention; MUA, manipulation under anaesthesia

PROM data was evaluated for each age group cohort. A further analysis was undertaken of each individual THA determining those achieving a minimal important change ((MIC) minimum score improvement of 8 or above) in OHS at each period of follow-up.¹⁴

Statistical analysis. Statistical analyses were undertaken by a clinically independent statistician (KHM) using anonymized data. A Kruskal-Wallis analysis was used to compare median OHS at each interval, Dunn's multiple corrections used to compare improvements between intervals, and a chi-squared test to investigate associations and proportions with complications and those achieving the MIC for each interval. Significance was set at < 0.05.

Results

Following preoperative exclusions, 1,008 of 1,091 primary THA were available for analysis, reducing to 1,004 following four intraoperative exclusions. Overall, 598 (59.6%) THAs were performed in female patients, with 580 (57.8%) right hips with a mean age of 65.9 years (23 to 93) (Supplementary Table ii). In 94.3% of

hips THA indication was primary degenerative osteoarthritis (947/1,004).

Implant usage is listed in Supplementary Table i. The majority of patients received a standard offset femoral component (602/1,004; 60.0%) of which 97.5% (587/602) were collared and confined mainly to females (84.2%; 507/602). Conversely, the high offset femoral component was mainly used in male patients (78.0%; 309/396) and uncollared (97.7%; 387/396). Mean cup size was 51.9 mm (48 to 62) with screw augmentation required in 13% (131/1,004), proportionally of greater use in the older groups. Predominant head usage was 28/32 mm used in similar distribution for all age groups; 36 mm heads were used in the remaining 14.1% (142/1,004), and more commonly in patients aged > 65 years.

Intraoperative complications included (Table III) a calcar crack on ten occasions (1%) and one osteoporotic greater trochanter fracture, without age group predominance. Each was wired with no resultant issue. No unrecognized perioperative periprosthetic fractures were encountered.

Table V. Comparison of medians above and below 65 years of age (GIRFT).

Timepoint	n		Median Oxford Score (IQR)		p-value*
	≤ 65 yrs	> 65 yrs	≤ 65 yrs	> 65 yrs	
Preop	430	574	14 (10 to 19)	14 (9 to 19)	0.781
6 wks	401	540	34 (27 to 40)	36 (30 to 42)	0.005
4.5 mths	356	483	40 (31 to 46)	41 (33 to 46)	0.613
1 yr	320	425	42 (32 to 47)	43 (36 to 47)	0.872
Timepoint	< 70 yrs	≥ 70 yrs	< 70 yrs	≥ 70 yrs	p-value*
Preop	597	407	14 (10 to 19)	14 (9 to 19)	0.810
6 wks	559	382	34 (27 to 40)	36 (30 to 42)	0.003
4.5 mths	501	338	40 (31 to 46)	41 (33 to 46)	0.912
1 yr	456	289	43 (32 to 47)	43 (33 to 47)	0.877

*Kruskal-Wallis test.
IQR, interquartile range.

Three patients died within the NJR notifiable window of 90 days (0.3%) whereas all-cause mortality for the almost ten-year study was 8.0% (71/893 patients, 11 involving staged bilateral THAs). NJR notifiable revisions occurred in 13 hips in 13 patients (overall 1.3% crude revision rate) but the majority (7/13) consisted of a debridement, antibiotics, and implant retention (DAIR) procedure for persisting postoperative wound ooze. Each DAIR was undertaken within one month of the index procedure, barring one acute infection at 58 months (Table IVA). Each DAIR included a modular bearing exchange, followed by an extended course of antibiotics. Only one DAIR subsequently required further revision for acute femoral component subsidence 6.5 years following the DAIR. Despite a well-fixed cup, a revision of all components was undertaken and accounts for the sole cup extraction (all intraoperative re-revision cultures proved negative). All other DAIR procedures have retained their primary uncemented femoral component and shell without evidence of infection to date (mean follow-up 46 months (22 to 72)).

Six remaining revisions were undertaken for either multiple dislocations or traumatic periprosthetic fracture (Table IVB). Mean time to revision was 29 months (9 to 63). Two traumatic periprosthetic fractures occurred in patients who had developed dementia and followed a fall. Three revision THAs were undertaken for instability following multiple dislocations, each treated with bearing exchange only. One other dislocation was irreducible closed, the patient anaesthetically unfit for any open/revision procedure and treated conservatively. One patient required an open reduction. A further seven required at least one closed reduction, to date all successfully managed conservatively. The overall rate for any THA dislocation was 1.2% (12/1,004), more common in those aged > 65 years (9/12 cases) but did not reach significance (chi-squared test, p = 0.892).

Table V and Supplementary Table iii document median OHS for all groups and Table VI patients

Table VI. Minimal important change in Oxford Hip Score. Set at an improvement of score of 8 or greater.

Timepoint	n	Achieving MIC (≥ 8)		p-value*	
Preop	1,004				
6 wks	941	833 (88.5)			
4.5 mths	839	783 (93.3)			
1 yr	745	702 (94.2)			
Timepoint	n	≤ 65	> 65	≤ 65 yrs	> 65 yrs
Preop	430	574			
6 wks	401	540	341 (85.0)	492 (91.1)	0.012
4.5 mths	356	483	324 (91.0)	459 (95.0)	0.032
1 yr	320	425	300 (93.8)	402 (94.5)	0.897
Timepoint	n	< 70	≥ 70	< 70 yrs	≥ 70 yrs
Preop	597	407			
6 wks	559	382	483 (86.4)	350 (91.6)	0.010
4.5 mths	501	338	461 (92.0)	322 (95.3)	0.090
1 yr	456	289	428 (93.8)	274 (94.8)	0.431

*Chi-squared test.
MIC, minimal important change.

achieving MIC. Mean OHS scores, documented in Table VII, allows comparison with The National PROMs report.¹⁵ With equivalent preoperative scores, a significantly greater median OHS was achieved within both elderly cohorts at six weeks compared to their younger counterparts. Subsequently the younger group median scores improved, reaching the maintained OHS of the older groups. In total, 88.5% of THAs (833/941) achieved an MIC at six weeks, increased to 93.3% (783/839) at 4.5 months and 94.2% (702/745) at one year. A significantly greater proportion of patients aged over 65 and 69 reached MIC at six weeks (p = 0.012 and p = 0.010, respectively, chi-squared test) compared to their younger cohorts (noted again for the > 65 group at 4.5 months (p = 0.032)). This significant advantage was lost as the younger groups improved.

Discussion

Despite the recent considerable pressure for cemented THA use in the elderly, in clinical practice the reverse has occurred.⁵ The answer to this supposed ‘paradox’ may well be that more information and specific age-related data are required.^{1,2,4} Our study fulfils this by presenting data for over 1,000 consecutive THAs in patients of all age groups and frailty, using one uncemented device, under one experienced surgical team, and with identical pre- and postoperative protocols.

Firstly, our overall crude THA construct survival for all ages is 98.7% (mean follow-up over five years), with a revision rate of 1.3%, comparable/better than commonly used cemented constructs in the NJR.⁴ Although the Registry does not record ‘single component’ survival, our analysis of this uncemented cup and femoral component was 99.9% and 99.6% respectively, for all ages and includes the elderly.

Table VII. Mean Oxford Hip Score (range).

Timepoint	All cases	GIRFT analysis		BPT analysis	
		65 yrs and under	> 65 yrs	< 70 yrs	70 yrs and over
Preop	14.6 (0 to 41)	14.5 (0 to 41)	14.6 (0 to 35)	14.5 (0 to 41)	14.6 (0 to 35)
6 wks	34.0 (6 to 48)	32.7 (7 to 48)	34.9 (6 to 48)	33.3 (7 to 48)	34.9 (6 to 48)
4.5 mths	37.9 (4 to 48)	37.3 (4 to 48)	38.4 (4 to 48)	37.6 (4 to 48)	38.4 (4 to 48)
1 yr	39.0 (3 to 48)	38.0 (4 to 48)	40.0 (3 to 48)	39.0 (4 to 48)	39.0 (3 to 48)
2 yrs	39.0 (4 to 48)	38.0 (4 to 48)	40.0 (9 to 48)	39.0 (4 to 48)	39.0 (10 to 48)

BPT, England NHS Best Practice Tariff; GIRFT, Get It Right First Time.

Secondly, revision for any reason amounted to 13 of the 1,004 THA constructs. Specifically using the NICE¹⁰ concept of ‘prosthesis dependent’ and ‘prosthesis independent’ failure, the majority were ‘independent’ (7/13 revisions) and related to delayed postoperative wound healing and/or suspected infection. Importantly, the NJR revision THA document has only in its most recent form (MDSv7.0 H2, June 2018)¹³ included any return to theatre for DAIR without modular implant change. Prior to this, it is likely DAIR procedures have been underreported, particularly in those patients without implant exchange. In our series, ‘prosthesis dependent’ failure occurred and revision required in only six patients, three for instability and three for traumatic periprosthetic fractures.

Thirdly, the overall dislocation rate, with or without revision, was 1.2% of THAs (12/1,004). Although dislocation was considered unrelated to the mode of fixation in a large recent series,¹⁶ the more limited facility to adjust the femoral version with uncemented devices, it would be more appropriate to consider this to be a potentially related complication. However, with all our cases undertaken via the posterior approach, this was more likely to have contributed to any instability than the fixation.¹⁷

Fourth, a frequently cited concern with uncemented devices in the elderly patient is the risk of intraoperative or early postoperative fracture.^{9,18,19} Intraoperative fracture occurred during ten procedures (1.0%). However, with routine preoperative templating and use of the calcar reamer allowing clear visualization, no unrecognized events required subsequent return to theatre. Interestingly, irrespective of manufacturer or mode of fixation, the majority of femoral components are prepared in a similar fashion, inserting progressively increasing sized rasps/broaches. The uncemented component might be considered as ‘leaving the last/trial broach in’.

Significantly, neither GIRFT nor BPT advise against uncemented components in younger patients. Furthermore, within the NJR analysis, uncemented metal on polyethylene articulations outperformed their cemented counterparts in under 55-year-olds beyond one year in males and three years in females.⁴ The younger patients within each analysis were therefore used in our study as a suitable comparative cohort.

In this series, assessing revision and implant survivorship, although a greater number of revisions were

undertaken in patients over 65 years (11/574 (1.9%) versus 2/430 (0.5%)), total numbers were small and did not reach significance (chi-squared test, $p = 0.382$). Similarly, for patients aged over 69, there was again no significant difference in incidence of revision (7/597 (1.2%) versus 6/407 (1.5%) 70 and above). Therefore, these findings do not support either GIRFT or BPT recommendations to avoid this uncemented system for concerns of implant safety or increased revision rates in the elderly.

It has been argued that older patients are simply unsuitable for revision, or decline surgery, raised as a potentially unrecognized issue by NICE.¹⁰ Our study has however identified only two such patients, both > 70 years, one unfit for revision (irreducible dislocation) and one aseptic femoral component loosening (presently electing for conservative care). Three further patients have required return to theatre for an open procedure, one for reduction of a dislocation, and two femoral fixations for B1 fractures (all of which were in patients aged > 70 years, and each with well-fixed implants).

Postoperative fractures remained low (10/1,004 (1.0%)) and, although not statistically significant, occurred more commonly in the older groups (one < 65 vs nine over 65 and three under 70 vs seven over 70 years). With differing modes of osteoporosis recognized between sexes,^{18,20} in this series the collared femoral component may have been protective in females and the maintained proximal femoral cortices of the male patient protective in receiving the high offset uncollared options.

In its most recent report,¹⁵ the National PROMs Programme (with retrieval rate of only 49.5%) presents a ‘Key Fact’ that 97% of respondents achieved ‘ANY’ improvement in OHS, with mean improvement 22.7 points at six months. This ‘national’ mean improvement was outperformed in our study, by all age groups, and at all assessment intervals beyond the early six-week postoperative review and with a markedly greater retrieval rate of 83.6% (839/1,004) and 77.2% (745/965) at 4.5 months and one year respectively. This outperformance specifically at 4.5 months is particularly relevant. Although not undertaken identically at six months (as per the National PROMs schedule), occurring six weeks earlier in our patients (due to local follow-up logistics), this finding reflects their more rapid recovery. Furthermore, presenting improvements to each individual

patient, beyond error and to a 'meaningful' level, identified 93.3% (783/839) and 94.1% (702/745) of THAs for the same periods (4.5 months/one year respectively) achieved an MIC in OHS.¹⁴ Surprisingly, a significantly greater proportion of those aged over 65/69, reached MIC earlier than the comparative younger patients. Median scores, purported as a more reliable method of presenting PROMs,²¹ demonstrated similar improvements. Specifically, with equivalent preoperative baseline scores, the elderly groups' median scores were greater at six weeks than their younger counterparts. Although no direct comparison with cemented implants was undertaken, these scores confirm excellent outcomes for these uncemented THAs and for all age groups.

A major driving factor for GIRFT and BPT to advise against cementless prostheses has been cost. Although we have not undertaken a formal cost analysis, we have found patient outcomes in the elderly as good if not better than their younger counterparts (where there is no argument against more costly uncemented devices). Interestingly, information is available in the literature with regard to costs. Several authors have concluded that cemented brands are unlikely to be the most cost-effective,^{22,23} and that inpatient care and length of stay are more important factors.²⁴ Our study has confirmed for this uncemented THA, revision burden is low, elderly PROMs improvement equivalent/better than the younger comparative group and with a recognized reduced operating time^{25,26} (acknowledged by GIRFT as 24 minutes less per case).¹ Furthermore, any revision either presented as an emergency or their issues identified during their index operative admission, and not within routine follow-up. As ODEP 13A implants,^{27,28} our study supports the developing body of evidence that extended costly follow-up is not required,^{29,30} including for the elderly.

Limitations of our study include the currently mid-term mean follow-up of five years and two months, with the potential for a large number of late failures to occur. However, long-term studies,⁷ independent evaluations,^{27,28} and focused NJR reports (importantly excluding metal-on-metal failures)³¹ confirm that this does not occur. Furthermore, an Australian registry analysis identified any increased uncemented revision burden over cemented occurs within three months of surgery.¹⁸ This being a large observational study, a power calculation was also not undertaken. It may therefore be underpowered to identify any low incident events between cohorts such as postoperative periprosthetic fracture. It is our intention to continue to follow-up these groups.

PROMs data collection was only undertaken routinely for the first two postoperative years. However, consistent with our data, a plateau of PROMs improvement is recognized from one year following THA.²¹ Additionally, our capture rate was high (83.6% vs 49.5% National PROMs¹⁵ at 4.5 months/six months respectively) and importantly a

statistical review of those patients with any missing data revealed an equivalent preoperative median score with those with available data (median 14 (IQR 9 to 19)).

Overall, 87 hips were excluded from analysis (87/1091, 8.0%), the majority acute neck of femur fractures or its treatment failure (57/87, 65.5%) with recognized increased morbidity/mortality.^{4,32} Although templating was undertaken for all patients, three THAs required unexpected intraoperative cemented alternatives, demonstrating that one system does not adequately address all diagnoses/patients.

Finally, each THA has been treated as an individual episode, as opposed to analysis of individual patients. Consistent with recent literature,³³ each THA has an independent risk of failure and with PROMs improvement recognized equivalent whether the THA is the first or subsequent undertaking.^{34,35}

In conclusion, this study shows that this uncemented THA can be used safely and effectively in the elderly population with low complication and revision rates. These findings do not support the current prosthetic recommendations made by either GIRFT or NHS BPT.

Supplementary material



Tables showing implants/techniques, preoperative demographic details, and Oxford Hip Scores.

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- M. H. Lewis: Edited and prepared the manuscript.
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