



MiniHip™

The evidence base

Corin

Connected Orthopaedic Insight

# MiniHip™

## 7A\* ODEP rating

MiniHip™ is one of the only stems on the market offering true bone conservation with secure metaphyseal fixation and anatomical restoration.

More than 35,000 implantations worldwide and many scientific publications supporting the performance of this system.

7A\* ODEP  
rating

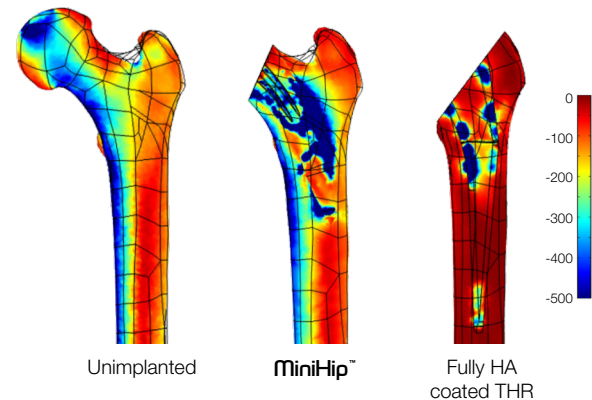


## 1. Physiological bone loading distribution

**Title** Load transfer into the proximal femur: are short stems more advantageous with respect to the mechanical environment?  
**Authors** Simpson D, Yeoman M, Lowry C, Cizinauskas A, Vincent G, Jerosch J, Collins S  
**Publication** ISB Congress, 2011

**Methods** Finite element models of two implants, MiniHip™ and a conventionally loaded HA coated hip stem, were used to simulate bone remodelling under physiological load condition (45% gait).

**Results** The correctly sized MiniHip™ transferred considerably more load into the proximal femur, and resulted in nearly twice the medial cortical strain, compared to the long stem.



**Conclusion** The short-stem implant may offer less mechanical disturbance on the femur, causing less bone loss in most zones and even inducing bone ingrowth in the lateral/distal region. Short stem implants may have the potential to be more bone conserving compared to conventional stems, and to minimise periprosthetic bone loss when correctly sized and implanted.

## 2. Lower risk of increasing CCD angle and reducing offset

**Title** Reproduction of the anatomy (offset, CCD and leg length) with a modern short stem hip design - a radiological study

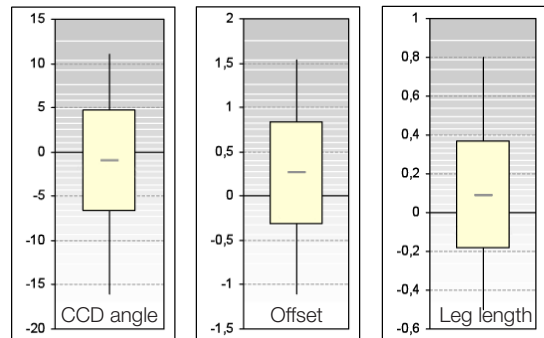
**Authors** Jerosch J, Grasselli C, Kothny PC, Litzkow D, Hennecke T

**Publication** Zeitschrift für Orthopädie und Unfallchirurgie, 2012

**Methods** In this prospective radiological study, 250 consecutive hips with osteoarthritis were included, 129 females and 117 males. The patients were operated on by five different surgeons with MiniHip™. Different anatomic parameters of the hip were documented using pre-operative and post-operative X-rays. All measurements were performed by an independent examiner.

**Results** Offset changed  $+0.28\text{cm} \pm 0.45\text{cm}$  after surgery, small decrease of  $-0.51^\circ \pm 4.10^\circ$  in the CCD angle and leg length increased by  $0.09\text{cm} \pm 0.34\text{cm}$ . No difference between male and female patients.

**Conclusion** The results showed that with MiniHip™ it was possible to reconstruct the individual geometry of the hip. The tendency of increasing the CCD angle and decreasing the offset seems not to be demonstrated.



### 3. Suitability for treating hip avascular necrosis

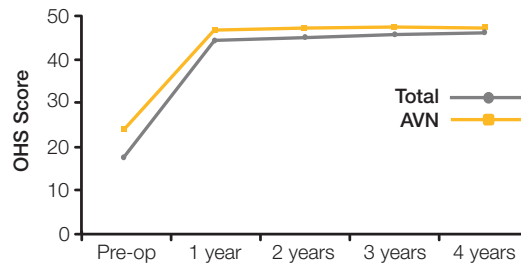
**Title** Is there an indication for a partial neck-preserving short stem (MiniHip™) in patients with avascular necrosis of the femoral head?

**Authors** Jerosch J, Grasselli C, Kothny C

**Publication** Deutscher Ärzte-Verlag, 2014

**Methods** In a prospective study design a total of 186 patients with a partial neck preserving stem (MiniHip™) were evaluated. There was a subgroup of 18 patients who suffered from secondary osteoarthritis due to avascular necrosis (AVN).

**Results** Oxford Hip Scores (OHS) showed significant improvement comparing pre-operative and post-operative values. There was no early aseptic loosening in the AVN group, no radiological abnormalities, especially no bone loss in Gruen zones 6 and 7 and no cortical reaction on the lateral femur.



**Conclusions** MiniHip™ seems to be a suitable stem for patients with secondary osteoarthritis due to AVN.

## 4. MiniHip™ through a direct anterior approach

**Title** Total hip arthroplasty by the direct anterior approach using a neck preserving prosthesis – a learning curve  
**Authors** Khemka A, Mograby O, Lord SJ, Doyle Z, Al Muderis M.  
**Publication** 16th EFORT Congress, 2015

**Method** 150 cases implanted in a single surgeon series with MiniHip™ and Trinity™. The cohort was further sub divided into 2 groups, 75 patients in each based on recruitment order. Outcomes assessments were collected including operative details, clinical (OHS and SF-36) and radiological evaluation.

**Results** Improvement in OHS and SF-36 of 26 and 29 points respectively.

	Group 1 (First 75 Cases)	Group 2 (second 75 cases)	Total
Intra-operative fracture	5	1	6
Peri-prosthetic fracture	1	0	1
Subsidence	1	0	1
Dislocation	1	0	1
Trochanteric bursitis	1	1	2
Anterior thigh numbness	8	4	12

**Conclusion** We propose that using MiniHip™ utilising the direct anterior approach is safe, reproducible and a reliable treatment for active patients. However, a learning curve interrelated with the implant design and surgical approach is recommended.

## 5. MiniHip™ compared to conventional hip and resurfacing

**Title** Which prosthetic system restores hip biomechanics more effectively?  
**Authors** Buttaro M, Nally F, Diaz F, Stagnaro J, Rossi L, Isidoror Slullitel P  
**Publication** Current Orthopaedic Practice, 2015

**Method** 124 patients with a mean age of 52 years (range: 26-65 years) operated through a posterolateral approach, with either MiniHip™, conventional cementless THA or resurfacing. Offset and leg length were measured compared to contralateral leg in the 3 groups.

### Results

	Group 1	Group 2	Group 3
Stem	MiniHip™	Conventional THA	Resurfacing
Number of patients	36	46	42
Offset (mm)	3.5	1.7	-3.9
Length discrepancy up to ±5mm	94.4%	86.9%	67.3%

**Conclusion** Restoration of the centre of rotation was equally precise with the three analysed systems. The leg shortening in the resurfacing group can be attributed to the inability to increase leg length. Whilst statistical differences in offset were seen it is unclear if this has any clinical significance. MiniHip™ restored leg length with more precision than the competitor cementless stem or resurfacing.

## 6. MiniHip™ versus resurfacing in surgery time and outcomes

**Title** Comparison of patient-reported outcomes from partial neck preserving, short-stem arthroplasty and resurfacing arthroplasty in younger osteoarthritis patients: a matched-cohort study

**Authors** Dettmer M, Pourmoghaddam A, Kreuzer S

**Publication** Advances in Orthopaedics, 2015

**Method** 125 patients received either MiniHip™ (n=73) or resurfacing (n=52). Surgery times were monitored and Hip Disability and Osteoarthritis Outcome Score (HOOS).

**Results** Both groups showed a significant increase all HOOS subscales.

	MiniHip™	Resurfacing
Surgery time (min)	62.5 ± 14.8	104.4 ± 17.8
Length of follow up (days)	495 ± 281	1422 ± 739

**Conclusion** The neck-preserving MiniHip™ may be preferable to resurfacing due to the less challenging surgery and similar outcomes.



## 7. DEXA results at 12 months

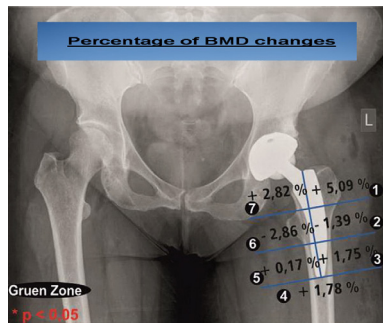
**Title** Periprosthetic bone density changes after MiniHip™ cementless femoral short stem: one-year results of dual-energy X-ray absorptiometry study

**Authors** Ercan A, Sokkar S, Schmid G, Filler T, Abdelkafy A, Jerosch J

**Publication** SICOT Journal, 2016

**Method** MiniHip™ was implanted in 62 patients. The age range of the patients who underwent treatment was 25-78 years. Periprosthetic bone density was determined within two weeks post-operatively, and after three, six, and twelve months utilising a DEXA scan.

### Results



This figure shows the periprosthetic bone density versus twelve months post-operatively. An increase in bone density was recorded both proximally in the Gruen zones 1 and 7 and distally in zones 3-5.

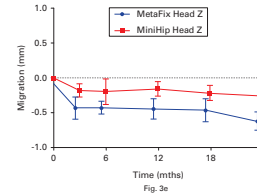
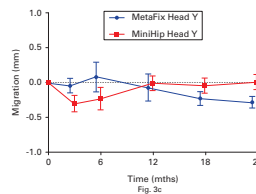
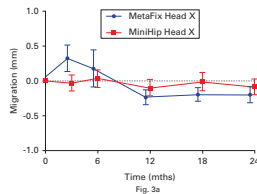
**Conclusion** MiniHip™ DEXA results are promising and comparable to good results of the other representatives of the femoral neck partially-sustaining short stem prostheses, with a lower proximal bone density reduction.

## 8. Primary stability of MiniHip™ - A 2 year follow-up

<b>Title</b>	Primary stability of a short bone-conserving femoral stem
<b>Authors</b>	Ferguson R, Broomfield J, Malak T, Palmer A, Whitwell D, Kendrick B, Taylor A, Glyn-Jones S
<b>Publication</b>	The Bone and Joint Journal, 2018

**Method** A total of 53 patients were randomised to receive cementless THA with either a short femoral stem (MiniHip™, mean age - 52 years) or a conventional length femoral stem (MetaFix™, mean age - 53 years). Radiographs for RSA were taken post-operatively and at three, six, 12, 18, and 24 months.

### Results



After one year, the mean subsidence of the head and tip for the MiniHip™ stem was 0.16mm and 0.08mm respectively.

### Conclusion

This study demonstrates that the short femoral stem has a stable and predictable migration. The MetaFix™ subsidence is comparable to equivalent long stem cementless devices. The lower subsidence in the MiniHip™ stem suggests that the device is stable, supporting the intention that stability would be achieved through three-point fixation.

## 9. MiniHip™ compared to another short stem

**Title** Four-year follow-up comparative study of implantation of a competitor stem and MiniHip™ short femoral cementless stems in total hip arthroplasty

**Authors** Lachowicz W, Bialecki J, Medina C, Cobo C, Vargas M, Berg K

**Publication** DKOU, 2018

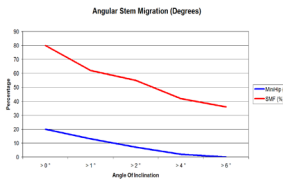
**Method** The data from 130 patients with a mean age of 57 years was analysed. 129 patients (99.3%) were operated on with a minimally invasive anterior approach (DAA).

### Results

**TAB 1. Unpaired t test results : Angular Stem Migration**

Angular Stem Migration (Deg)	MiniHip (%)	SMF (%)
> 0°	24	80
> 1°	13	62
> 2°	7	55
> 4°	2	42
> 6°	0	36

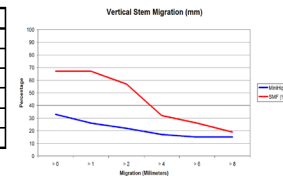
P value = 0.0009 (extremely statistically significant)



**TAB 2. Unpaired t test results : Vertical Stem Migration**

Vertical Stem Migration (mm)	MiniHip (%)	SMF (%)
> 0	33	77
> 1	26	67
> 2	22	57
> 4	17	32
> 6	15	26
> 8	15	19

P value = 0.0395 (statistically significant)



- The survivorship at 4 year follow-up was 92.8% for a competitor stem and 100% for MiniHip™.

- The distal femur cortical hypertrophy (stress shielding) occurred in 33 cases (39%) of the competitor stem, whereas only five cases (11%) of MiniHip™.

### Conclusion

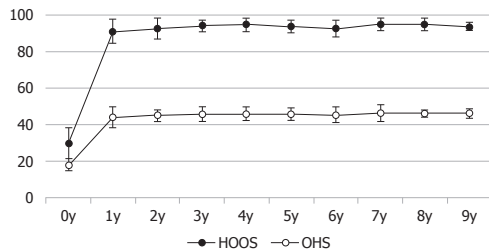
The angular and vertical stem migration was significantly lower for MiniHip™ than the competitor stem. This study indicated a lower revision rate for MiniHip™ when compared to a competitor short femoral cementless stem.

## 10. MiniHip™ 10 year data

<b>Title</b>	Long-term results of an anatomically implanted hip arthroplasty with a short-stem prosthesis MiniHip™
<b>Authors</b>	Von Engelhardt L, Breil-Wirth A, Kothny C, Seeger JB, Grasselli C, Jerosch J
<b>Publication</b>	World Journal of Orthopedics, 2018

**Methods** 186 patients underwent hip arthroplasty with a partial neck preserving short stem (MiniHip™). The mean age at the time of surgery was 59.3 years (range 32 to 82 years). The Oxford Hip Score (OHS) and the HOOS were assessed pre-op and each year after surgery. The mean follow-up was  $112.5 \pm 8.2$  months.

### Results



One year after surgery, both the HOOS and OHS improved significantly from a mean of  $30 \pm 8.3$  to  $91 \pm 6.7$  and from  $18 \pm 3.3$  to  $44 \pm 5.8$  points respectively. After this initial improvement, the scorings stayed on the same level.

The survivorship for aseptic loosening at 9 - 10 years was 98.66%. The overall survival for the stem with revision for any reason was 97.32% at the same time point.

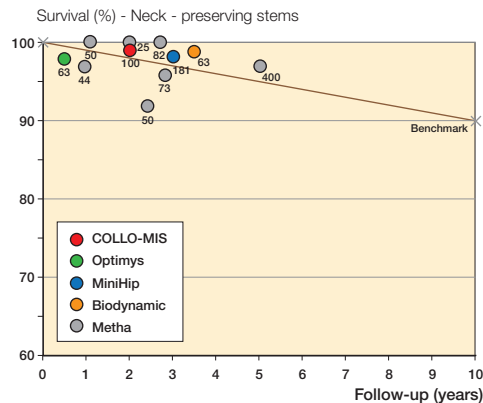
**Conclusion** This study revealed a convincing and lasting clinical outcome. The radiological findings suggest a physiological proximal load transfer with a reliable metaphyseal anchoring and an excellent long-term stem survivorship, which is at least comparable to standard prostheses and other short stem concepts with a high rate of survival and low rate of revision.

## 11. Good survival rates and ability to recreate patient biomechanics

<b>Title</b>	Revision rates after short-stem total hip arthroplasty – a systematic review of 49 clinical studies
<b>Authors</b>	Van Oldenrijk J, Molleman J, Klaver M, Poolman RW, Haverkamp D
<b>Publication</b>	Acta Orthopaedica, 2014

**Methods** This systematic review evaluated 49 studies involving 19 different stems and discussed the large number of studies on neck preserving stems, partial neck-preserving stems and neck-sacrificing stems.

### Results



This graph shows that MiniHip survival meets the NICE benchmark, with better survivorship than average results for neck-preserving stems of a similar design.

### Conclusion

Few stems achieved good biomechanic reconstruction in the review. All of these stems were neck-preserving or trochanter-sparing stems such as MiniHip™. MiniHip™ was able to achieve good recreation of biomechanics, including leg length and offset. The survivorship of MiniHip™ met the NICE benchmark when compared to similar stems.

A detailed view of a MiniHip hip joint component. It features a light purple ceramic head with a textured grey acetabular cup. The head is mounted on a polished metal neck, which is covered in a textured grey sleeve. The component is set against a dark grey background with a yellow vertical bar on the left.

MiniHip™

7A\* ODEP  
rating

Ceramic liners and ceramic on ceramic articulations are available in the USA only for use in an approved investigational device exemption clinical study.

1. Simpson D, Yeoman M, Lowry C, Cizinauskas A, Graham V, Jerosch J, Collins S. Load Transfer into the Proximal Femur; Why Short Stems Are More Advantageous With Respect to the Mechanical Environment. ISB Congress 2011.
2. Jerosch J, Grasselli C, Kothny PC, Litzkow D, Hennecke T. Reproduction of the anatomy (offset, CCD, leg length) with a modern short stem hip design-a radiological study. *Z.Orthop.Unfall.* 150.1 (2012): 20-26.
3. Jerosch J, Grasselli C, Kothny PC. Is there an indication for a partial neck preserving short stem (MiniHip) in patients with an avascular necrosis of the femoral head?. *4* (2014): 178-83.
4. Khemka A, Mograby O, Lord SJ, Doyle Z, Al Muderis M. Total Hip Arthroplasty By The Direct Anterior Approach Using A Neck Preserving Prosthesis - A Learning Curve. 16th EFORT Congress, 2015.
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6. Dettmer M, Pourmoghadam A, Kreuzer SW. Comparison of Patient-Reported Outcome from Neck-Preserving, Short-Stem Arthroplasty and Resurfacing Arthroplasty in Younger Osteoarthritis Patients. *Adv Orthop.* 2015;817689.
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11. Van Oldenrijk J, Molleman J, Klaver M, Poolman RW, Haverkamp D. Revision rate after short-stem total hip arthroplasty: a systematic review of 49 studies. *Acta Orthop.* 2014;85(3):250-8.

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