What does your hip patient want to get back to?

Hip pain limited Tim Taylor’s performance. After choosing the BHR system, he is back to enjoying activities pain free.
Why BHR™?

What does your hip patient want to get back to?

The BIRMINGHAM HIP™ Resurfacing (BHR) System was designed to provide younger or more active patients with a bone-preserving, anatomically correct alternative to total hip arthroplasty that may support an active lifestyle.

After his BHR procedure, former pro quarterback Steve Beuerlein returned to coaching his son’s football team. A study shows improved function and faster recovery in BHR system patients compared to patients with THA.¹
Where do you want your hip patient to be in 15 years?

A wear resistant metal-on-metal articulation, large diameter bearing and bone preserving procedure provides durability, stability and preservation of normal anatomy that may improve the patient's long-term results.

**THA has great results – For younger or active patients, BHR results are even better**

The Australian National Joint Registry shows a higher recorded survivorship rate in both the male <55 years of age and male 55-64 years of age groups for primary hip resurfacing procedures compared to primary conventional hip procedures (primary diagnosis OA excluding infection). The BHR system was designed as an alternative for these younger or more active patients where, historically, total hip replacements have not performed as well.

<table>
<thead>
<tr>
<th>Resurfacing vs THA male 55-64</th>
<th>Resurfacing vs THA male &lt;55</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
</tr>
</tbody>
</table>
Bone preservation

Bone preservation is a central concern for younger patients who want to return to an active lifestyle. By preserving the function of existing bone rather than removing and replacing a large section of the femur, natural anatomical biomechanics can be maintained.

Improved bone strength

The BHR™ system preserves a large portion of the natural femoral neck and head. Studies show a significant increase in proximal femoral bone mineral density (BMD) in BHR patients compared to THA patients at two years. These studies conclude that the BHR device better transfers physiological load for preserving bone stock than a long-stemmed device.3,4

Post-operative stability

The larger diameter bearing and bone preserving procedure of the BHR system may restore patients' normal anatomy. This, in turn, can reduce the risk of dislocation.

Revision Surgery

Which would you rather revise after 10 years, BHR (Figure 1) or THA (Figure 2)? Total hip replacement patients can experience proximal femoral bone resorption and distal remodeling, as shown here. The BHR system preserves this bone, which therefore may be in condition to receive a primary stem at the time a total hip could require a complex revision.
Globally proven clinical results

The BIRMINGHAM HIP™ Resurfacing (BHR™) System has demonstrated exceptional clinical results worldwide.

Published articles from around the world demonstrate **unrivaled performance of the BHR device** in many surgical centers.

<table>
<thead>
<tr>
<th>Author</th>
<th>Site</th>
<th>N</th>
<th>% survival</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMinn et al³</td>
<td>Birmingham</td>
<td>1,626</td>
<td>98.4</td>
<td>5 years</td>
</tr>
<tr>
<td>Shimmin et al⁴</td>
<td>Melbourne</td>
<td>230</td>
<td>99.1</td>
<td>5 years</td>
</tr>
<tr>
<td>Treacy et al⁵</td>
<td>Birmingham</td>
<td>144</td>
<td>98.0</td>
<td>5 years</td>
</tr>
<tr>
<td>Nishii et al⁶</td>
<td>Osaka</td>
<td>50</td>
<td>96.0</td>
<td>5 years</td>
</tr>
<tr>
<td>Steffen et al⁷</td>
<td>Oxford</td>
<td>79</td>
<td>95.1</td>
<td>7 years</td>
</tr>
<tr>
<td>Oswestry Registry⁸</td>
<td>8 countries – 45 surgeons</td>
<td>1,354</td>
<td>97.2</td>
<td>7 years</td>
</tr>
</tbody>
</table>

The BHR system is the world leader of hip resurfacing

The 2008 Australian Joint Replacement Registry Annual Report⁵ contains data from September 1999 to December 2007 and is among the most compliant registries globally.

- With 7,682 implantations, the BHR device accounts for 72% of all resurfacing devices implanted to date in the registry.
- The BHR device has follow up from the inception of the registry in 1999 and consistently shows the **lowest recorded revision rate** of any resurfacing device for seven years.

Australian National Joint Registry Annual Report 2008 –
**Yearly cumulative percentage revision of resurfacing hip systems**

<table>
<thead>
<tr>
<th>Resurfacing product</th>
<th>Cumulative percent revised</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year</td>
</tr>
<tr>
<td>ASRM</td>
<td>3.8</td>
</tr>
<tr>
<td>Adept™</td>
<td>0.5</td>
</tr>
<tr>
<td>BHR</td>
<td>1.5</td>
</tr>
<tr>
<td>Conserve™ Plus</td>
<td>3.2</td>
</tr>
<tr>
<td>Cormet®</td>
<td>2.1</td>
</tr>
<tr>
<td>Cormet 2000 (HAP)</td>
<td>6.3</td>
</tr>
<tr>
<td>Durom®</td>
<td>3.5</td>
</tr>
<tr>
<td>Mitch™ TRH</td>
<td>1.7</td>
</tr>
<tr>
<td>Recap™</td>
<td>5.7</td>
</tr>
</tbody>
</table>
Metallurgy matters at startup

The BHR™ implant is produced using high carbon cobalt chrome left in the As Cast (never heat treated) micro-structural condition. As Cast components show substantially less wear than heat-treated components.\(^\text{11}\)

Double heat-treated CoCr implant

A magnified cross section of a double heat-treated CoCr implant shows block carbides depleted in both quality and quantity. Thermal processes – including hot isostatic pressing, solution heat treatment and sintering – alter the microstructure directly affecting the wear resistance of the material.\(^\text{12, 13, 14}\)

Wear studies have shown that cobalt chrome in the As Cast form has superior wear resistance compared to other forms of the alloy.\(^\text{15, 16, 17}\)

Clinical data examining a single surgeon series of resurfacing cases has shown a decrease in long-term survivorship with a double heat-treated implant versus a single heat-treated implant with identical implant geometry.\(^\text{18}\)

As Cast CoCr BHR implants

Magnified cross sections show block carbides* integrated throughout the metal structure. These carbides are harder than the metal substrate and reduce wear, especially at startup.

As Cast CoCr Ring implant

A magnified cross section retrieved after 26 years in-vivo shows block carbides integrated throughout the metal structure. BHR metallurgy is based on this successful clinical heritage.

Double heat-treated CoCr implant

A magnified cross section of a double heat-treated CoCr implant shows block carbides depleted in both quality and quantity. Thermal processes – including hot isostatic pressing, solution heat treatment and sintering – alter the microstructure directly affecting the wear resistance of the material.\(^\text{12, 13, 14}\)

10 year Kaplan-Meier Survival Analysis of CORIN Hip Resurfacings

(Revision for any reason as the end-point)
Clearance matters in motion

The BHR™ system is designed to a precise geometry based on clinically successful first generation metal-on-metal total hips, which provides fluid lubrication in the bearing reducing long-term wear.19

Providing fluid lubrication

The longevity of a metal-on-metal bearing is linked to its ability to generate and sustain a fluid film. At rest, static pressure can force fluid out of the bearing. In motion, hydrodynamic forces create a fluid film that lubricates the joint.

There is an optimal radial clearance* associated with each bearing diameter. When this clearance is produced, the converging wedge between the head and cup draws in and transports lubricating fluids between the components extremely well.

In comparison, studies show that smaller clearances result in increased friction.20, 21 Increased friction can lead to frictional torque force between the head and cup that can cause cup micromotion which may hamper bone ingrowth.22 Smaller clearances may not allow sufficient lubrication which may increase long-term wear.23

In hip arthroplasty, impaction of the cup can result in cup deflection. Ultra-low clearance bearings can suffer from a “clamping” effect if the combination of deflection and low clearance does not allow for actual net clearance.

Superior fixation

The BHR implant has a hemispherical cup design with the cast-in POROCAST™ ingrowth surface. This HA coated ingrowth surface does not require any heat treatment to attach beads and therefore preserves the carbide structure. This surface is integral to the cup and not a spray on coating.
References

1. Haddad FS, Bull J, Soler JA. Hip resurfacing has superior sustained functional outcomes when compared to Total Hip Arthroplasty. Presented at: AAOS. March 6-8, 2008; San Francisco, CA.
5. FDA Review Memo, BHR Important Medical Information, Page 59.

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