Modularity and Tapers in Total Joint Replacement Devices

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Foreword

THIS COMPILATION OF Selected Technical Papers, STP1591, Modularity and Tapers in Total Joint Replacement Devices, contains peer-reviewed papers presented at a symposium held November 10, 2014, in New Orleans, LA, USA. The symposium was sponsored by ASTM International Committee F04 on Medical and Surgical Materials and Devices and Subcommittee F04.22 on Arthroplasty.

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Contents

Overview viii

The Clinical Picture

Trunnion Options in Primary Total Hip Arthroplasty in 2014 1
Carlos J. Lavernia, Christopher P. Emerson, Jesus M. Villa, and Stephen D. Cook

Orthopaedic Surgeon Modularity Utilization and Surgical Technique Considerations in the Face of Implant Corrosion 10
Marcus C. Ford, John W. Harkess, and William M. Mihalko

Patient Outcomes Following Implantation of Modular Neck Hip Prostheses in Primary Total Hip Arthroplasty 17
Robert Borden, Aidin Eslam Pour, Takayuki Murayama, and J. David Blaha

Corrosion at the Head-Neck Taper Interface Affects the Prognosis of Hip Revision Surgery 26
Emmanouil Liodakis, Alberto Carli, David Zukor, Olga Huk, and John Antoniou

Fretting Corrosion and Modularity: A Critical Review of the Literature and Three Registries 34
John M. Cuckler

Retrieval Taper Connection Damage Assessments

Is Taper Fretting Corrosion a Threat to the Clinical Performance of Large-Diameter Hips with Highly Crosslinked Polyethylene Bearings? 45
Steven M. Kurtz, Daniel W. MacDonald, Jeremy L. Gilbert, Michael A. Mont, Gregg Klein, Antonia Chen, Matthew Kraay, Brian Hamlin, and Clare M. Rimnac

Contact Mechanics and Plastic Deformation at the Local Surface Topography Level After Assembly of Modular Head-Neck Junctions in Modern Total Hip Replacement Devices 59
Hannah J. Lundberg, Nguyen Q. Ha, Deborah J. Hall, Robert M. Urban, Brett R. Levine, and Robin Pourzal
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors Related to Imprinting Corrosion in Modular Head-Neck Junctions</td>
<td>83</td>
</tr>
<tr>
<td>Douglas W. Van Citters, Audrey J. Martin, John H. Currier, Sang-Hyun Park, and Avram A. Edidin</td>
<td></td>
</tr>
<tr>
<td>Microgrooved Surface Topography Does Not Influence Fretting Corrosion of Tapers in Total Hip Arthroplasty: Classification and Retrieval Analysis</td>
<td>99</td>
</tr>
<tr>
<td>Christina Arnholt, Richard Underwood, Daniel W. MacDonald, Genymphas B. Higgs, Antonia F. Chen, Gregg Klein, Brian Hamlin, Gwo-Chin Lee, Michael Mont, Harold Cates, Arthur Malkani, Matthew Kraay, Clare Rimnac, and Steven M. Kurtz</td>
<td></td>
</tr>
<tr>
<td>Validating a Simplified Method for Assessing Total Hip Arthroplasty Taper Corrosion Susceptibility with a 15-Year Retrieval Database</td>
<td>113</td>
</tr>
<tr>
<td>Patrick Aldinger, Jacob Cartner, and Bob Jones</td>
<td></td>
</tr>
<tr>
<td>Method for Characterization of Material Loss from Modular Head-Stem Taper Surfaces of Hip Replacement Devices</td>
<td>132</td>
</tr>
<tr>
<td>Radu Racasan, Paul Bills, Liam Blunt, Alister Hart, and John Skinner</td>
<td></td>
</tr>
<tr>
<td>Comparison of Visual Assessment Techniques for Wear and Corrosion in Modular Hip Replacement Systems</td>
<td>147</td>
</tr>
<tr>
<td>Matthew A. Di Prima, Oleg Vesnovsky, Paul Kovacs, Robert H. Hopper, Jr., Henry Ho, Charles A. Engh, Jr., and L. D. Timmie Topoleski</td>
<td></td>
</tr>
<tr>
<td>Metrology for Dual Taper Total Hip Arthroplasty</td>
<td>164</td>
</tr>
<tr>
<td>Douglas W. Van Citters, Dylan J. Assael, and John H. Currier</td>
<td></td>
</tr>
<tr>
<td>Mechanically Assisted Crevice Corrosion Damage in Shoulder Arthroplasty Is Comparable to Hip Arthroplasty</td>
<td>181</td>
</tr>
<tr>
<td>Testing and Standards for Modular Taper Junctions</td>
<td></td>
</tr>
<tr>
<td>Jeremy L. Gilbert, Sachin A. Mali, and Shiril Sivan</td>
<td></td>
</tr>
<tr>
<td>Femoral Stem Modularity: A Structural Fatigue Characterization</td>
<td>224</td>
</tr>
<tr>
<td>Christine S. Heim and A. Seth Greenwald</td>
<td></td>
</tr>
<tr>
<td>Accelerated Fretting Corrosion Testing of Modular Necks for Total Hip Arthroplasty</td>
<td>237</td>
</tr>
<tr>
<td>Satya Nambu, Richard Obert, Michael Roark, Eleonora Delvechhio, Doug Linton, Scott Bible, and Jon Moseley</td>
<td></td>
</tr>
<tr>
<td>Correlating Fretting Corrosion and Micromotions in Modular Tapers: Test Method Development and Assessment</td>
<td>259</td>
</tr>
<tr>
<td>Sachin A. Mali and Jeremy L. Gilbert</td>
<td></td>
</tr>
</tbody>
</table>

vi
Tribocorrosion in Hip Modular Taper Junctions: Load-Triggered Transitions in Electrochemical and Mechanical Behavior
Mathew T. Mathew, Megha Patel, Dmitry Royhman, Maria Runa, Joshua Jacobs, Markus A. Wimmer, and Nadim J. Hallab

A Servoelectric Apparatus with Potentiostat to Study the Fretting Corrosion of Cobalt-Chromium–Titanium Alloy Couples
Johnny Dufils, Michel P. Laurent, Joachim Kunze, Dmitry Royhman, Mathew T. Mathew, Vincent Fridrici, and Markus A. Wimmer

Simultaneous Hip Head-Stem Taper Junction Measurements of Electrochemical Corrosion and Micromotion: A Comparison of Taper Geometry and Stem Material

On the Measurement of Three-Dimensional Taper Moments Due to Friction and Contact Load in Total Hip Replacement
C. Kaddick, M. Malczan, C. Buechele, M. Hintner, and M. A. Wimmer

The Importance of Cleaning Modular Parts on Visual Scores of Taper Damage
Ashleen Knutsen, Sang-Hyun Park, Edward Ebramzadeh, and Pat Campbell

Validation of an Optical Coordinate Measuring Machine for the Measurement of Wear at the Taper Interface in Total Hip Replacement
R. B. Cook, C. Maul, and A. M. Strickland

Studies of Modular Connections for Surgical Implant Devices
Jack E. Lemons

The Biologic Response

Diagnosis and Management of Adverse Local Tissue Reactions Secondary to Products of Tribocorrosion
Darren R. Plummer, Craig J. Della Valle, Richard A. Berger, Wayne G. Paprosky, Scott M. Sporer, and Joshua J. Jacobs

Corrosion of Modular Junctions in Femoral and Acetabular Components for Hip Arthroplasty and Its Local and Systemic Effects
Deborah J. Hall, Robin Pourzal, Craig J. Della Valle, Jorge O. Galante, Joshua J. Jacobs, and Robert M. Urban

Histological Characterization of Chromium Orthophosphate Corrosion Products from Modular Total Hip Replacements
Michael Shang Kung, Pat Campbell, John Markantonis, Ashleen Knutsen, Bijan Ameri, Sang-Hyun Park, and Edward Ebramzadeh

Tissue Response in Metal-on-Metal Hip Articulations Is Dependent on Head Size
Gurpal Singh and Christoph H. Lohmann
Overview

The introduction of modularity in total joint replacement devices, most notably in the hip, has brought significant flexibility to the reconstructive surgeon when faced with complex musculoskeletal pathologies inclusive of biomechanical deficiency, deformity, and bone loss. These problems are not easily solved by monoblock devices in the primary and revision setting. Assembly of modular hip systems is accomplished through the use of interconnecting tapers, which have introduced challenges in terms of defining their in-vivo performance using preclinical, in vitro test methods. Topics of relevance to modular taper connections include structural damage; component disassembly; metallic debris; fretting, corrosion, and ion release. In some patients, material loss from modular tapers has been associated with adverse local tissue reactions as well as elevated chromium and cobalt serum levels in blood. It remains unclear why some patients exhibit a clinically significant reaction to the products of material loss from modular tapers, whereas others do not.

This ASTM special technical publication (STP) is an outgrowth of an ASTM symposium held on November 10, 2014, in New Orleans, Louisiana. The purpose of this symposium was to provide a forum for consensus development and scientific exchange on the needs for characterization and standardized testing related to modularity and tapers used in total joint replacement devices. The main focus of this symposium was to address unmet standardization needs and to help establish best testing practices in the following four areas:

- Characterization of fretting, corrosion and associated adverse tissue reactions
- What retrievals tell us in total joint arthroplasty
- Contemporary and evolving test methodologies
- Design parameters for taper connections in total joint arthroplasty

This STP contains 29 papers derived from both podium and poster presentations from clinicians and scientists whose goal was to provide contemporary insight into the evolving knowledge base of the tapered connections employed in modular joint replacement implant systems.
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