

University of Groningen

Implications of a polymer meniscus implant on knee tribology

Ehsani Majd, Sara

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Ehsani Majd, S. (2016). *Implications of a polymer meniscus implant on knee tribology*. [Thesis fully internal (DIV), University of Groningen]. Rijksuniversiteit Groningen.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Implications of a polymer meniscus implant on knee tribology

Sara Ehsani Majd

2016

This research forms part of the Project P2.03 TRAMMPOLIN of the research program of the BioMedical Materials Institute, co-funded by the Dutch Ministry of Economic Affairs.

The purchase of UMT-3 tribometer setup was done using the grant no. 91112026 from the Netherlands Organization for Health Research and Development (ZonMW).

The printing of this thesis was financially supported in part by Bruker Ltd.



Implications of a polymer meniscus implant on knee tribology

By **Sara Ehsani Majd**

University Medical Center Groningen, University of Groningen
Groningen, The Netherlands



Layout and cover design by Manuel N. Melo

Copyright © 2016 by Sara Ehsani Majd

Printed by Netzdruk, Groningen

ISBN (printed version): 978-90-367-8814-4

ISBN (electronic version): 978-90-367-8813-7

The cover design was inspired by the traditional Persian handicrafts of inlaid turquoise and copper.



rijksuniversiteit
groningen

Implications of a polymer meniscus implant on knee tribology

Proefschrift

ter verkrijging van de graad van doctor aan de
Rijksuniversiteit Groningen
op gezag van de
rector magnificus prof. dr. E. Sterken
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

maandag 30 mei 2016 om 16.15 uur

door

Sara Ehsani Majd

geboren op 23 januari 1983
te Tehran, Iran

Promotor

Prof. dr. ir. H. J. Busscher

Copromotores

Dr. P. K. Sharma

Dr. R. Kuijer

Beoordelingscommissie

Prof. dr. S. K. Bulstra

Prof. dr. ir. E. van der Heide

Prof. dr. ir. N. Verdonschot

To my dear parents

تقدیم به پدر و مادر عزیزم

Paranimfen

Ekaterina Ovchinnikova

Rebecca van der Westen

CONTENTS

Chapter 1	Introduction and Aim of the Thesis	1
Chapter 2	Both Hyaluronan and Type II Collagen Keep Proteoglycan 4 (Lubricin) at the Cartilage Surface in a Condition that Provides Low Friction during Boundary Lubrication	15
	Sara Ehsani Majd, Roel Kuijer, Alexander Köwitsch, Thomas Groth, Tannin A. Schmidt and Prashant K. Sharma Langmuir, 2014, 30 (48), 14566–14572	
Chapter 3	Role of Hydrophobicity on the Adsorption of Synovial Fluid Proteins and Biolubrication of Polycarbonate Urethane: Materials for Permanent Meniscus Implants	33
	Sara Ehsani Majd, Roel Kuijer, Tannin A. Schmidt and Prashant K. Sharma Materials & Design, 2015, 83, 514–521	
Chapter 4	An <i>in vitro</i> Study of Cartilage–Meniscus Tribology to Understand the Changes Caused by a Meniscus Implant	51
	Sara Ehsani Majd, Aditya Iman Rizqy, Hans J. Kaper, Tannin A. Schmidt, Roel Kuijer and Prashant K. Sharma (submitted for publication)	
Chapter 5	General Discussion	73
	Bibliography	79
	Summary	94
	Samenvatting	98
	Abbreviations	105
	Acknowledgments	107

