

## UvA-DARE (Digital Academic Repository)

### Towards virtual forensic anthropology

Methodological and practical issues related to the use of clinical computed tomography (CT) data Colman, K.L.

Publication date 2019 Document Version Other version License Other

Link to publication

### Citation for published version (APA):

Colman, K. L. (2019). Towards virtual forensic anthropology: Methodological and practical issues related to the use of clinical computed tomography (CT) data.

#### **General rights**

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), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

#### **Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.



## TOWARDS VIRTUAL FORENSIC ANTHROPOLOGY:

Methodological and practical issues related to the use of clinical computed tomography (CT) data



Kerri Lee Colman

Kerri Lee Colman

### TOWARDS VIRTUAL FORENSIC ANTHROPOLOGY:

# Methodological and practical issues related to the use of clinical computed tomography (CT) data

Kerri Lee Colman

## Towards virtual forensic anthropology:

# Methodological and practical issues related to the use of clinical computed tomography (CT) data

ACADEMISCH PROEFSCHRIFT

## TOWARDS VIRTUAL FORENSIC ANTHROPOLOGY: Methodological and practical issues related to the use of clinical computed tomography (CT) data

Cover Design:	Ricky ter Steege and proefschrift-aio.nl   Guus Gijben
Layout:	proefschrift-aio.nl   Guus Gijben
Printed by:	NBD Biblion   proefschrift-aio.nl
ISBN:	978-94-93184-11-4

© Copyright, Kerri Lee Colman, Amsterdam 2019

No part of this thesis may be reproduced, stored or transmitted, in any form or by any means, without the permission in writing of the copyright owners. Copyright of the published chapters is held by the journals in which the work appears.

This work described in this thesis was conducted at the Amsterdam UMC, Location Academic Medical Center (AMC), University of Amsterdam. The printing of this thesis was financially supported by the Amsterdam UMC, Location Academic Medical Center (AMC), the Co van Ledden Hulsebosch Center, Amsterdam Center for Forensic Science and Medicine (CLHC) and the Stichting ter Financiering van Barge's Anthropologica.



ter verkrijging van de graad van doctor aan de Universiteit van Amsterdam op gezag van de Rector Magnificus prof. dr. ir. K.I.J. Maex ten overstaan van een door het College voor Promoties ingestelde commissie, in het openbaar te verdedigen in de Aula der Universiteit op woensdag 27 november 2019, te 11.00 uur

door

Kerri Lee Colman geboren te Morningside

Mom and Dad

"Forensic anthropology is that branch of physical anthropology which, for forensic purposes, deals with the identification of more or less skeletonized remains known to be, or suspected of being human. Beyond the elimination of nonhuman elements, the identification process undertakes to provide opinions regarding sex, age, race, stature, and such other characteristics of each individual involved as may lead to his or her recognition."

T. Dale Stewart, 1979

### Promotiecommissie:

prof. dr. R.R. van Rijn	AMC-UvA
prof. dr. R.J. Oostra	AMC-UvA
dr. A.E. van der Merwe	AMC-UvA
dr. H.H. de Boer	AMC-UvA
prof. dr. M.C.G. Aalders	AMC-UvA
dr. B.S. de Bakker	AMC-UvA
prof. dr. E.N. L'Abbé	University of Pretoria
prof. dr. N. Lynnerup	University of Copenhagen
prof. dr. G.J.R. Maat	Universiteit Leiden
prof. dr. U.J.L. Reijnders	AMC-UvA
prof. dr. J. Stoker	AMC-UvA
	prof. dr. R.J. Oostra dr. A.E. van der Merwe dr. H.H. de Boer prof. dr. M.C.G. Aalders dr. B.S. de Bakker prof. dr. E.N. L'Abbé prof. dr. R.N. Lynnerup prof. dr. G.J.R. Maat prof. dr. U.J.L. Reijnders

Faculteit der Geneeskunde

### CONTENTS

Chapter 1: General introduction and scope of this thesis	9	
Part 1: Sex estimation: classification accuracies and method developmen	t	
Chapter 2: The performance of sex estimation methods using pelvis, per geographic region: a systematic review	21	
Chapter 3: Dutch population specific sex estimation formulae using the proximal femur	59	
Part 2: The use of virtual bone models in forensic anthropology: exploring precision and accuracy of 3D virtual bone models		
Chapter 4: The geometrical precision of virtual bone models derived from clinical computed tomography data for forensic anthropology		
Chapter 5: The accuracy of 3D virtual bone models of the pelvis for morphological sex estimation	97	
Chapter 6: Virtual forensic anthropology: the accuracy of osteometric analysis of 3D bone models derived from clinical Computed tomography (CT) scans	113	
Chapter 7: Summary and general discussion	135	
Chapter 8: Samenvatting en discussie	143	
Addenda		
Affiliations of co-authors		
List of publications by the author		
Acknowledgments		
About the author		
PhD Portfolio	159	