Laser mediated cartilage reshaping

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I want to express my gratitude to Professor Martin J.C. van Gemert for providing me with this unique opportunity to complete this thesis and pursue a degree at the University of Amsterdam. J. Stuart Nelson introduced Professor van Gemert to me at “Los Cuatro Gatos” in Barcelona where the BiOS/Europto meeting was held in 1995. Stuart, Martin, Sol Kimel, Mark Dickinson, Terry King, Lars Svaasand, and Tom Milner were attending this meeting, and we all ate dinner together one night along with some other “characters” in this discipline. (I think us “younger guys” got stuck with most of the bill!). Over dinner, MJCVG mentioned that he was going to spend a year on sabbatical at UC Irvine and suggested that we work together on some projects. Such was the birth of this thesis and my association with the Professor and the Academic Medical Center in Amsterdam. Our collaborative worked focused on ablation, heat transfer, and some photoacoustic experiments on projects related to laser applications in the middle ear. That topic is a long way away from the focus of this thesis, but all laser biomedical applications start with light distribution and heat transfer; studying ablation is the best way to begin to learn and understand these processes, particularly when you are a medical doctor. I hope this explains how an American, illiterate and non-verbal in Dutch ended up in Amsterdam on 1 June 2001.

Barcelona figures into this thesis in another way. In that city (along with Los Angeles in 1993 and San Jose in 1994), Tom Milner, Emil Sobol, and myself had a series of meetings which ultimately lead to the start of cartilage reshaping research in Irvine and later in Austin. Maybe it was the walks down the Ramblas, climbs up Gaudi’s cathedral or just eating tapas and beer, but my interest in cartilage took off after that conference. I am eternally grateful to both Tom and Emil for providing me with so many ideas and starting points for research in this field. Above all, Tom’s provided me with guidance and support in more ways than I can count as a mentor, supervisor, colleague, and friend.

I have been very fortunate in that I was allowed to pursue this most unique academic and clinical pathway over the last ten years at UC Irvine. Dr. Roger Crumley, Professor and Chairman of the Department of Otolaryngology- Head and Neck Surgery has made this possible, constructing a custom residency-fellowship-faculty curriculum and transition that has allowed me to pursue my dreams. I am indebted to Professor Crumley for allowing me to pursue this unique pathway. In a parallel sense, Professor Stuart Nelson at the Beckman Laser Institute has provided me with sage advice, material support, and so many opportunities to build the scientific structure of my career. I am very lucky to have been mentored by Dr. Nelson, as have nearly a dozen other young investigators who launched their careers at the Beckman Laser Institute and are now on faculty at UC Irvine and other universities.

Going back into basic research after the numbing experience of medical school (combined with the numbing experience of living in “Bawlmer”) was quite a transition. I am grateful to Lars Svaasand, Mark Dickinson, Sam Tanenbaum and Yossi Neev for “rehabilitating” a scientist, and teaching me about experimentation, physical measurements, modeling, logic and common sense. I was also lucky to work with Steen
Madsen and Johannes de Boer, whom I respect for their incredible knowledge of physics (and everything in general) and for their intellectual purity and integrity. They are also great friends (and awesome skiers). I wish they were both at UC Irvine still, but at least now I have someone to visit in Las Vegas and Boston. Leacky Liaw gave me tons of advice on how to succeed at UC Irvine and academia in general. This sort of information isn't in a book or on the web. Chung Ho Sun taught me a lot about cell biology, a topic I knew very little about. From Professor Bruce Tromberg, I learned about how to think broadly about research, expand my horizons, and focus on the translation of basic research into clinical practice. I am especially grateful to Professor Michael W. Berns, who first supported me in the laboratory at Beckman, and has continued to do so. The Beckman Laser Institute is his creation, and provides an incredibly stimulating and diverse environment to develop new ideas and technology.

Research isn't done in a vacuum and the environment at Beckman is intellectually rich. The work in this thesis has benefited from the formal and informal input of so many friends and colleagues including Hong Kim (before and after his Peace Corps stint in Ghana), Sergio Diaz, Curtis Chapman, Karsten Koenig, Thorsten Spott, Matthias Fehr, Tuan Pham (an inspiration and the hardest working medical student I have ever met), Sergey Telenkov, Bahman Anvari, Olivier Coquoz, Vincent Wallace, Zhongping Chen, Wim Verkruysse, George Peavy, Petra Wilder-Smith, Laurie Newman, Matt Brenner, Marie Wilson, Joyce Zeiler, Vasan Venugopalan, Yona Tadir, and Mariah Coleno. The ideas of several clinicians also indirectly permeates the work in this thesis: Mark E. Krugman, taught me prudence and caution in surgery, William Armstrong showed me why we need better reconstructive solutions, Art Salibian showed me how to fill holes made by oncologists, Timothy Kelley, who has the patience of a saint, took me through several dozen rhinoplasties, and Glenn Allison introduced me to the seminal research of Gibson, Fry, and Gillies. Ellen Takahashi and Tina MacKenzie made life in Otolaryngology bearable, and without them at times, the Otolaryngology Department would have collapsed. Jeff Andrews and Glen Profeta (the tall one) made the toys at Beckman work. Melissa Moushay, Dianne Wilson, Erin Miller, and Chris Anderson made the execution of research (and grant applications) massively efficient.

An army of residents, grad students, medical students, and engineering students cracked open pig heads in the cartilage lab. Cliff Chew and Tim Kuo were the first MDs in the laboratory and experienced garage lab research without being in a garage. Cliff, Tim, and Hong started this big mess with Tom Milner and I, when we had no funds and sneaked supplies out of the hospital to do our research. I thank these three for their good graces and patience. Ryan Gallivan stunned the Otolaryngology community by making a poster with a pig head on it. Mike Keefe is the jack of all trades and brought his comprehensive knowledge of jazz, bricklaying, plumbing, zip codes, parenting, Democratic politics, and auto repair to the lab. John Chang is just starting and has some big footsteps to follow. Yong Seok Chae has brought reshaping to a new level. Amir Karamzadeh, Alex Rasouli, and Mai Thy Truong form the troika who for four years worked like they were on a mission from god. Charlie Kim, Mark Gaon, Ken Chao, Eugene Chu, Mark Yamaguchi, and Jong In Youn came from other universities but are part of the pig lab alumni. Likewise, Darren Gray, Joey Kimball, Andy Harrington,
Jason Ro, Elizabeth Johansen, and Matt Burden came from Harvey Mudd College and tagged teamed their way through three revisions of a reshaping machine. The “Joeytome” enabled so many of our more advanced studies. I can’t leave out the undergraduate directed research students who always make me feel simultaneously very old and very young: Jon Lee, Vivian Sung, Reshmi Basu, Ming Si, Nidhi Pandooh, Simon Evans, and of course UCI’s first “cyber criminal” Xavier Dao.

The last three people I would like to mention know nothing about cartilage, but know everything about me. I would like to dedicate this thesis to my parents Richard and Hazel, and to the love of my life, my wife Caroline.