SEX AFTER HIP IMPLANTS

A GUIDE BASED ON MOTION CAPTURE

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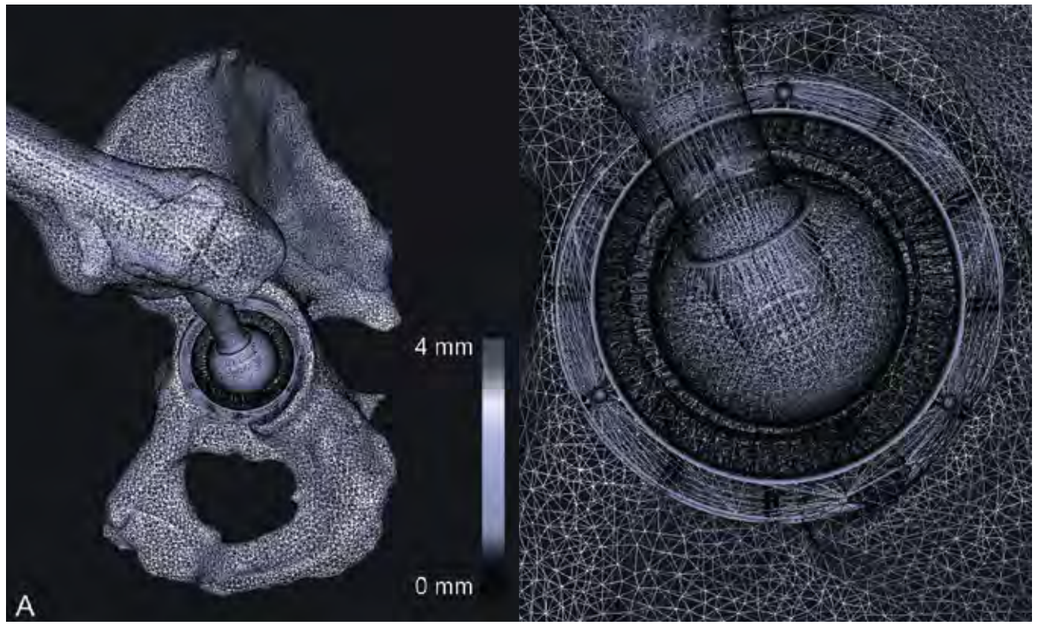

Motion capture in the biomechanics field has a long history. Since the pioneer work of M.A. Lafortune in 1984, this technology has continuously provided valuable answers in understanding the mobility of the human joints.

BY CAECILIA CHARBONNIER
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I remember the day when Dr. Panayiotis Christofilopoulos, Orthopaedic Surgeon at the University Hospitals of Geneva, came to my office. He told me, "I have a new project. I would like you to analyze what are the best sexual positions that could be performed after total hip replacement". I replied, laughing, if he was kidding me. He said, "No, I am not this is a very serious scientific question. Lots of my patients wonder about the risks related to sexual activity after surgery and I have no answers to provide them!"

Several months passed. My team and I were very busy working on the research project MyHip whose aim was to improve the surgical planning for total hip arthroplasty (THA). In this project, we were in charge of the simulation of prosthetic hip joint 3D models based on motion capture data of daily activities. It is at this particular moment I thought, why not capture sexual positions? After all, these movements are part of everyday life and sex is the oldest recreational activity of all! This is how the study began. We asked Medacta International SA, who were also involved in the MyHip project as industrial partner, for their authorization to use their prosthetic models for a very uncommon study. They agreed and we started looking for volunteers willing to participate in the study. The research questions were twofold: first, to quantify the hip range of motion necessary to perform sexual positions, which was unknown at that time; second, to objectively evaluate during their practice the relative risk of impingement – when there is a collision or contact between the prosthetic implant components or bone-to-bone contact. When this happens, there is a greater risk that patients can dislocate their hip. Although there have been some studies that have looked into this matter, for instance, by means of questionnaires relating to sexual difficulties before and after THA, this aspect remains largely unexplored and rarely discussed between patients and surgeons.

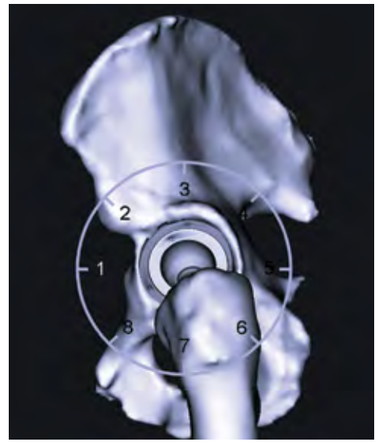
Several weeks later, we were ready to acquire the necessary data for the study. Two brave young and healthy volunteers, one female and one male, accepted to undergo Magnetic Resonance Imaging (MRI) and motion capture. The MRI scans were used to reconstruct 3D models of their hips and to verify that no joint abnormalities could affect the results of the study. We planned the motion capture session at night when everybody left the lab.

After being sure to have locked the studio's door, my colleague Sylvain Chagué and I equipped our two volunteers with reflective markers, and we captured twelve different common sexual positions with our 24 T40S cameras. The session lasted about two hours. The day after, we tackled the post-processing of the data. As you can imagine, we were faced with many marker occlusions but it wasn't an issue thanks to Vicon's Blade.

The data was imported in custom software and the hip joint kinematics were computed from the recorded markers trajectories. This was achieved using a previously developed optimized fitting algorithm which accounts for skin motion artifacts and patient-specific anatomical constraints. This algorithm has an error of 0.5 mm in translation and < 3° in rotation, which is quite accurate. The resulting computed motions were applied to the volunteer's hip joint 3D models, reconstructed from their MRI data, and hip ranges of motion were determined at each point of the movement. The next step was to evaluate joint instability and to determine whether or not impingement occurred during sexual activity after THA. The recorded kinematic data was hence used for the simulation of prosthetic hip models. We tested and simulated nine implant configurations to account for the different ways in which surgeons have implanted the prosthesis. Whenever impingement occurred, we noted down the location and range of motion responsible for that impingement.

Results showed that sex posed a greater risk for woman than for men, because more mobility was required for the various sexual positions that involved extreme hip flexion and abduction. Out of the 12 sexual positions, we found four positions for women that should be avoided and only one position for men. This means patients can still have good sex after their surgery.

Motion capture in the biomechanics field has a long history. Since the pioneer work of M.A. Lafortune in 1984, this technology has continuously provided valuable answers in understanding the mobility of the human joints. Over time, motion capture systems have become more and more precise allowing researchers to study increasingly complex movements, from a simple walk to high performance sport, and now sex. Thanks to this technology, we were able to provide surgeons with specific instructions or guidelines to patients' enquiries. I believe that such a study can help a lot of patients having total hip replacement today.



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