Section: **Segmentierung, Registrierung**

ID: 109

Abstract-Title:
NAVIGATED TRANSFER OF OSTEOTOMY LINES FOR AUTOLOGOUS BONE GRAFTINGNAVIGIERTE ÜBERTRAGUNG VON OSTEOTOMIELINIEN FÜR AUTOLOGE KNOCHENTRANSPLANTATIONEN

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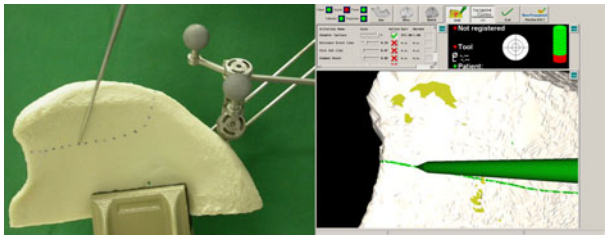
Abstract-Text:
Purpose
In the case that large defects in the mandible have to be reconstructed due to tumor or trauma, bone grafts from the iliac crest are transplanted together with their supplying vessels. In order to support the surgeon in this task, the optimal osteotomy line can be constructed using a computer system. This virtual osteotomy line then has to be transferred to the actual bone. From research in bone healing, we know that the gap size between two bone pieces has to be less than 3 mm in order to achieve a sufficient stability of the joined bone. This yields the accuracy that is necessary for the transfer. In this study, we wanted to find out how accurately we can transfer a planned osteotomy line to a bone model. Method
Five different iliac bones were cast into plastic models for this experiment, see figure 1a. Each bone model was surface scanned with a high resolution optical scanner. Based on this model, an osteotomy line was planned, see figure 1b. A tracker was attached to the bone model and the surface was measured using an interactive sculpting method, see figure 1c. A spatula is moved along the bone surface and the motion of the spatula is recorded by the navigation system. Due to the known geometry of the spatula, the bone surface can be reconstructed from the motion. All the positions where the spatula did not move through are considered lie within the bone. In that manner, the surface of the bone can be reconstructed interactively and without the use of additional measuring systems. The sculpted surface was then registered to the optically scanned surface in order to display the planned osteotomy line. A pointer was displayed color-coded depending on the distance of the pointer tip to the planned osteotomy line, see figure 2. If the distance of the tip to the osteotomy line was larger than a fixed threshold, the pointer was displayed blue, lese it was displayed green. Using this as guidance, marks were applied to the bone surface along the osteotomy line. The bone was scanned again, this time the texture of the bone was measured as well, yielding the marks. The distance of the marks to the planned osteotomy line was then computed using the previous surface scan as a reference.
Results
924 marks were measured on 25 bone models of 5 different iliac bones. The mean distance was 1,1 mm, standard deviation 1,2 mm. The 95% percentile of the distribution

was 3,6 mm, see figure 3.Conclusion
The combination of a new registration method together with a simple, color-coded user interface makes an easy transfer of osteotomy-lines possible. The accuracy is sufficient for the use in bone grafting for autologous bone transplantation. The application of transferring virtual osteotomy lines can also be applied to other fields such as finding the optimal trepanation line in neurosurgery.

Bild 1/JPG

Bild 2/JPG



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