Trauma surgery at the AMC in Amsterdam

Philips BV Pulsera with 3D imaging

Who/where

Academisch Medisch Centrum Amsterdam (AMC), The Netherlands. 1000 bed university hospital in Amsterdam.
Dr. R. Haverlag, trauma surgeon

Challenge

Intra-operative check of correct positioning of complex joint fractures

Solution

Philips BV Pulsera with 3D imaging

The AMC (Academisch Medisch Centrum) Amsterdam is a 1000-bed hospital in the south-eastern district of Amsterdam, the Netherlands, and includes the medical faculty of the University of Amsterdam. The hospital is a tertiary referral center for a wide range of specialisms and clinical services.

In addition to the specialized referral services, the AMC serves as a general hospital for South-East Amsterdam and the outlying districts. In the surgical departments, more than 100,000 operations are performed annually.

The AMC, together with the VU Medical Center Amsterdam, forms the North-West Netherlands trauma team: one of ten regional trauma teams in the country. The AMC has five traumatologists who are responsible for first-line emergency help. The same traumatologists continue to support their patients through the recovery and revalidation process.

Dr. Haverlag is one of the trauma surgeons. In his work he often encounters complex joint fractures. When using intra-operative 2D fluoroscopy, incorrect repositioning or incorrect placement of extra-osseous and intra-articular screws can remain undiscovered, and are only recognized on a postoperative CT scan. This means that the patients then have to undergo a revision surgery procedure.

The BV Pulsera

PHILIPS

Dr. R. Haverlag (right) and
Ir. Bart Carelsen (left)

For more than a year Dr. Haverlag has been using a BV Pulsera with 3D-RX. This is a mobile surgical C-arm system, with provision for intra-operative three-dimensional imaging. This enables any problems with fracture repair or fixation material (especially for the extremities) to be detected during the operation, so that any action needed to ensure a satisfactory result can be taken immediately.

"The 3D images obtained using the BV Pulsera with 3D-RX have better resolution and contrast than comparable systems".

The 3D images are acquired using the "propeller" movement of the BV Pulsera. This gives a high degree of mechanical stability, so that the image reconstruction is unaffected by mechanical vibration. Dr. Haverlag: "In my opinion the 3D images obtained using the BV Pulsera with 3D-RX have better resolution and contrast than those of comparable systems, and are relatively insensitive to metal artifacts."

"Different zoom sizes and images per run allow us to choose the optimal setting for each anatomy".

For surgery of the foot and ankle the largest image intensifier field (31 cm) is generally used, providing an 18x18x18 cm^3 reconstruction volume to cover the whole region of interest. For hand surgery, 23 cm field is used, giving a 12x12x12 cm^3 reconstruction volume with greater detail. According to Dr. Haverlag: "The different zoom sizes and different number of images per run allow us to choose the optimal settings for each anatomical region"

The BV Pulsera with 3D-RX has been used in 32 trauma operations to date, including surgical correction of extensive intra-articular fractures of the wrist and ankle. The following clinical example clearly shows the added value of intraoperative 3D imaging. This patient had a luxation fracture of the ankle. After fixation a fluoroscopic 2D image was made and, on the basis of this image, it was decided that the repositioning was satisfactory. However, a 3D scan was also made. This showed that there was a discongruence in the talocrural joint: the connection between the fibula and the tibia was too tight, with marked rotation of the talus. Because of these findings immediate revision was performed. The 3D scan made after that showed that the syndesmosis between the tibia and fibula was now correctly positioned, and that the rotation of the talus axis had been corrected.

"On the basis of the 3D images the patient could be closed with confidence".

Dr. Haverlag: "On the basis of the 3D images the patient could be closed with confidence. In view of this and similar experiences we now use 3D imaging as a postoperative check in all complex wrist, ankle and foot fractures".

2D fluoroscopy image, showing that repositioning seems satisfactory

3D fluoroscopy image: coronal, sagittal and axial views, showing that the repositioning is not satisfactory. The connection between the fibula and the tibia is too tight, with marked rotation of the talus.

3D fluoroscopy image after the immediate revision: coronal, sagittal and axial views. The syndesmosis between the tibia and fibula is now correctly positioned, and the rotation of the talus axis has been corrected.

The second clinical example is the fixation of a fracture of the hamatum. This is relatively easily achieved with the help of intra-operative 3D.

Dr. Haverlag: "The 3D-RX system provides accurate intra-operative images with high detail. Clearly this technique enhances the safety, efficiency and cost effectiveness of minimal invasive trauma surgery by obtaining optimal fracture reduction/fixation placement and avoiding failures. Furthermore, the extra surgery time is well justified by the added precision and the decrease of the need for revision surgeries".

3D views showing the initial hamatum fracture (left) and the repositioning

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