

483 Advanced Analysis in Medical Imaging – Role in Diagnosis and Surgical Preoperative Planning for Complex Articular and Pelvic Ring Fractures in Trauma Emergencies

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Background: Complex articular fracture is frequently encountered diagnosis in trauma practice. It usually raises special surgical issues due to, for example, incomplete preop diagnosis, inaccurate evaluation of the fracture pattern, or deficient pre-op planning.

Methods: Using special features in addition to an in-house developed medical imaging application, we could thoroughly analyze the three-dimensional pattern of the fractures, which allowed both a more precise diagnosis, and an accurate pre-operative planning, based on enhanced visualization of the geometric distribution of fracture fragments, as well as of the neighboring vascular elements and cavity organs. Our medical imaging toolkit allows fast and accurate three-dimensional rendering of the anatomic scene from scanned image datasets of different radiological modalities. It uses efficient methods and algorithms for various rendering and analysis tasks. The processed three-dimensional scenes offer the complete insight and functional tooling necessary for detailed surgical planning.

Conclusions: The three-dimensional complex articular and pelvic ring fractures analysis represents a useful method for preoperative diagnosis and planning, reducing the duration of surgical intervention and unwanted intraoperative miscalculations and inconsistencies.

484 Head CT Findings in Alcohol Intoxicated Patients

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Objective: To find out severity of brain injury in alcohol intoxicated patients after mild (GCS 13–15) brain injury.

Methods: A retrospective study of all patients in whom cranial CT (CCT) scan was performed between October 2006 and September 2007. Information of alcohol intoxication, injury mechanism, details of facial/head injuries, admission GCS, CCT findings and type of treatment were retrieved from patients' medical records. Alcohol intoxicated patients older than 15 years were included. A special attention was paid to subgroup of patients with unknown history.

Results: There were 151 alcohol intoxicated patients. One hundred and three (68,2%) patients had no signs of head/facial injury on CCT scans, 14 (9,3%) patients had fractures of nasal bones or maxillary/frontal sinuses only. Thirty four (22,5%) patients had positive CCT scans for brain injury or basal/vault fracture. Four (2,6%) patients were operated, 2 (1,3%) for depressed skull fracture and 2 (1,3%) for subdural hematoma. There was no statistically significant difference between patients with and without CCT scan abnormalities based on GCS ($p = 0,133$). The most frequent findings on CCT scan were vault fracture in 21 patients (61,8%) and subarachnoid haemorrhage in 15 patients (44,1%). There were 4 (14,8%) positive CCT scans in subgroup of 27 patients in whom history was unknown („found lying” in the street).

Conclusion: The prevalence of brain injury in alcohol intoxicated patients after mild brain injury was 22,5% with the need for neurosurgical intervention in 2,6%. Key words: alcohol intoxication, mild brain injury, cranial computed tomography.

485 Non Displaced Scaphoid Fractures: Conservative Treatment Is Still Preferred

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Introduction: The choice of treatment of non-displaced scaphoid fractures is controversial. Newly developed fixation screws result in an increasing tendency to fixate these fractures. Percutaneous stabilization of scaphoid fractures seems to reduce the non-union rate and accelerate return to work. Benefits of screw fixation are short term immobilization and rehabilitation. Cast immobilization for non- or minimal displaced scaphoid fractures, however, results in a union rate of more than 90 %. Immobilization is generally advised to last eight to twelve weeks. We studied the functional and clinical results for six weeks of cast-immobilization to analyze outcome differences with the generally advised protocol.

Materials and Methods: In a retrospective study, 90 consecutive patients who were treated conservatively between 2004 and 2007 for a non-displaced scaphoid fracture were included. They were analysed for trauma mechanism, treatment modality, diagnostic modalities, duration of cast-immobilisation and complications. Functional outcome was analyzed using the DASH-score.

Results: Six weeks of cast-immobilization resulted in > 70 % consolidation and a good clinical outcome. The remaining 20% healed between eight to twelve weeks. Six patients developed to delayed union and were treated surgically.

Conclusion: We recommend cast immobilization for the initial treatment of non-displaced scaphoid fractures, as time benefits of surgical treatment are limited. An immobilization period of only six weeks shows satisfactory results in the majority of patients.

486 Ultrastructural Properties of the Coracoclavicular Ligaments and the Hamstring Tendons as an Autogenous Graft in Coracoclavicular Ligament Reconstruction – an Electron Microscopic Pilot Study

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Introduction: In recent studies there has been the attempt to reconstruct dislocated acromioclavicular joints with the use of free tendon autografts. Thus, the objective of the present pilot study was to assess the ultrastructural properties of the coracoclavicular ligaments and the hamstring tendons, to see if the use of these tendon grafts, is eligible from an ultrastructural point of view, in coracoclavicular ligament reconstruction.

Methods: The coracoclavicular ligaments and the hamstring tendons were harvested bilateral from a male cadaver and 2,87 ㎛2 of each specimen were analysed with a transmission electron microscope. The total number, diameter and cross-sectional area of the collagen fibrils were measured.

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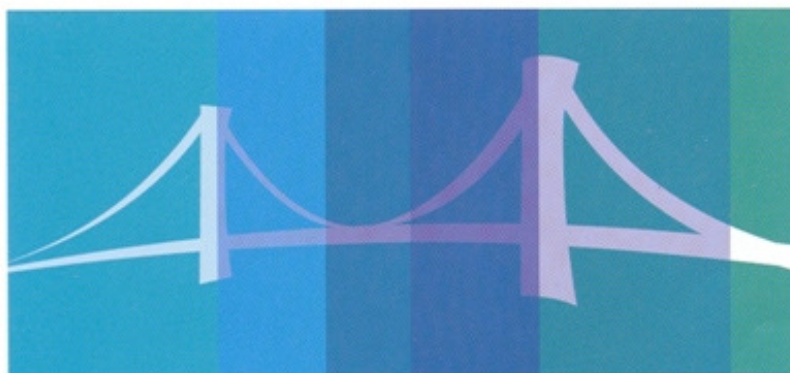
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ADVANCED ANALYSIS IN MEDICAL IMAGING – ROLE IN DIAGNOSIS AND SURGICAL PREOPERATORY PLANNING FOR COMPLEX ARTICULAR AND PELVIC RING FRACTURES IN TRAUMA EMERGENCIES

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BACKGROUND

The complex articular fractures are frequently encountered in trauma practice.

Difficult surgical problems occurs, in part due to incomplete pre-operative diagnose, fracture pattern wrong assessment by surgeon and incomplete pre-operative planning.

METHODS

We used an advanced medical imaging technology for three-dimensional analysis of fracture, allowing a more precise pre-operative diagnose, an accurate pre-operative planning by rendering of exact ratios of fragmented fracture parts, including vascular elements and cavities in near vicinity.

The original, in-house developed medical imaging software allows fast and accurate three-dimensional rendering of anatomic scene from scanned images of multiple radiological modalities. It uses public domain ITK and VTK algorithms for raw data management and regrouping, image pre-processing and filtering, image segmentation and modeling to create the 3D reconstructed images, all algorithms are customized and optimized for easy user interaction and fast rendering.

Segmentation algorithms used here:

- o Region Growing Connected Threshold (RGCT) algorithm with semi-automatically set threshold interval
- o Watershed with optimized predefined parameters

3D Model of segmented domain using Marching Cube algorithm with decimation and smoothing; rendering using surface rendering.

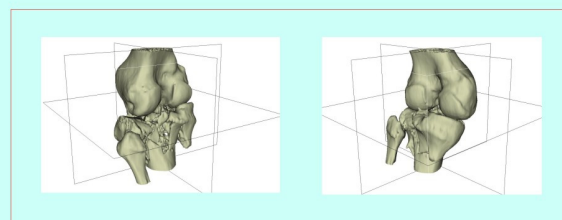
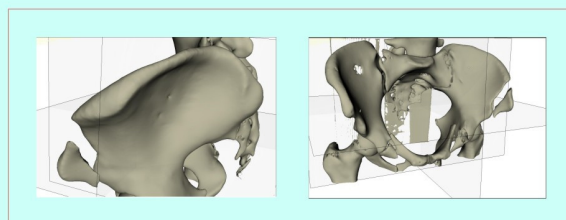
Multiple models can be defined; each model can be assigned a different color, or shown/removed from the scene. In the case of complex fractures, each fragment can potentially be assigned a different color.

The obtained images are analyzed by the surgical team, allowing an detailed surgical planning. Relative displacement of fracture fragments allows pre-operative simulation of intervention procedure.

RESULTS

· Pelvic ring fracture: CT, 144 slices 512 x 512

Knee injury with multiple fracture: CT, 120 slices



CONCLUSIONS

The three-dimensional complex articular and pelvic ring fractures analysis represents an useful method for pre-operative diagnose and planning, reducing the duration of surgical intervention and unwanted inter-operative "surprises".

Further developments of current software includes solution for complex relative displacement (translations, rotations), simulated insertion

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