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Training and Practice of Orthopaedic Surgery are Stressful Endeavours

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Description

Qualities of health care and safety have been emphasized by various professional and governmental groups. However, no standardized method exists for grading and reporting complications in orthopaedic surgery. Conclusions regarding outcomes are incomplete without a standardized, objective complication grading scheme applied concurrently. The general surgery literature has the Clavien-Dindo classification that meets the above criteria. We asked whether a previously reported classification would show high intraobserver and interobserver reliabilities when modified for orthopaedic surgery specifically looking at hip preservation surgery. We therefore determined the interreader and intrareader reliabilities of the adapted classification scheme as applied to hip preservation surgery.

Computed Tomography

We adapted the validated Clavien-Dindo complication classification system and tested its reliability for orthopaedic surgery, specifically hip preservation surgery. There are five grades based on the treatment required to manage the complication and the potential for long-term morbidity. Forty-four complication scenarios were created from a prospective multicentre database of hip preservation procedures and from the literature. Ten readers who perform hip surgery at eight centers in three countries graded the scenarios at two different times. Fleiss' and Cohen's κ statistics were performed for interobserver and intraobserver reliabilities, respectively. Training and practice of orthopaedic surgery are stressful endeavours, placing orthopaedic surgeons at risk of burnout. Burnout syndrome is associated with negative outcomes for patients, institutions and, especially, the surgeon. The aim of this review is to summarize available literature on burnout among orthopaedic surgeons and provide recommendations for future work in this field. The revision of an orthopaedic procedure can present surgeons with the challenge of a complex reconstructive process. Orthopaedic surgery can also face considerable challenges in cases presenting extensive primary injuries with multiple bone fragmentation, as well as in cases presenting bone deformities. Radiographs are used routinely for orthopaedic surgical planning, yet they provide inadequate information on the precise three-dimensional extent of bone defects. Three-dimensional reconstructions from X-ray computed tomography offer superior visualization but are not portable for consultation or readily available in the operating theatre for guidance during a procedure. A physical model manufactured from X-ray computed tomography data can offer surgeons a clear understanding of complex anatomical detail, by providing an intuitive physical relationship between patient and model. Rapid prototyping was used for the construction of an anatomical model in a case presenting with a complex shoulder injury. The model provided a definitive interpretation of joint pathology and enabled a full assessment of the degree of injury. Recent developments in computer assisted surgery offer promising solutions for the translation of the high accuracy of the preoperative imaging and planning into precise intraoperative surgery.

Musculoskeletal Geometry

Broad clinical application is hindered by high costs, additional time during intervention, problems of intraoperative man and machine interaction, and the spatially constrained arrangement of additional equipment within the operating theater. An alternative technique for computerized tomographic image based preoperative three-dimensional planning and precise surgery on bone structures using individual templates has been developed. For the preoperative customization of these mechanical tool guides, a desktop computer controlled milling device is used as a three-dimensional printer to mold the shape of small reference areas of the bone surface automatically into the body of the template. Thus, the planned position and orientation of the tool guide in spatial relation to bone is stored in a structural way and can be reproduced intraoperative by adjusting the position of the customized contact faces of the template until the location of exact fit to the bone is found. No additional computerized equipment or time is needed during surgery. The feasibility of this approach has been shown in spine, hip, and knee surgery, and it has been applied clinically for pelvic repositioning osteotomies in acetabular dysplasia therapy. A model is developed of the human lower extremity to study how changes in musculoskeletal geometry and musculotendon parameters affect muscle force and its moment about the joints. The lines of action of 43 musculotendon actuators were defined based on their anatomical relationships to three-dimensional bone surface representations. A model for each actuator was formulated to compute its isometric force-length relation. The kinematics of the lower extremity was defined by modeling the hip, knee, ankle, subtalar, and metatarsophalangeal joints. Thus, the force and joint moment that each musculotendon actuator develops can be computed for anybody position. The joint moments calculated with the model compare well with experimentally measured isometric joint moments. A graphical interface to the model has also been developed. It allows the user to visualize the musculoskeletal geometry and to manipulate the model parameters to study the biomechanical consequences of orthopaedic surgical procedures. For example, tendon transfer and lengthening procedures can be simulated by adjusting the model parameters according to various surgical techniques. Results of the simulated surgeries can be analysed quickly in terms of post-surgery muscle forces and other biomechanical variables.