Commentary

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Integrating Bone Health Assessment for Improved Surgical Planning

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Description

Age-related illnesses including osteoporosis and degenerative spinal disorders have also become more common in the elderly population due to longer life expectancies; also, the older population's desire to maintain their level of physical activity has led to a notable rise in the need for spine surgery. Elderly patients with lumbar degenerative disorders are usually treated with PSF, especially when using pedicle screws. However, because it depends so much on the state of the bones, this technique can provide difficulties for spine surgeons when working with them. In the last ten years, the number of patients receiving spinal fusions who are 65 years of age or older has increased exponentially. Interestingly, the population in this age range is predicted to increase by 2050. Furthermore, compared to cases with normal bone density, the prevalence of osteopenia and osteoporosis in posterior lumbar fusion and thoracolumbar fusion surgeries was reported to be 58.6% and 10%, respectively. These findings may increase the risk of PSF complications, such as instrument failure, PJK, PJVF, and pseudoarthrosis, by nearly twofold.

Spinal instrumentation

In light of the fact that a significant number of patients with osteopenia or osteoporosis require spinal surgery and that good spinal instrumentation depends on healthy bone, spine surgeons have assessed a number of methods to make up for the loss of bone mass. For example, utilizing longer and larger screws, including hooks, and surrounding the screw with bone cement. Despite being the most promising approach, cement augmentation with polymethyl methacrylate has sparked concerns due to possible side effects. Research has shown that pedicle screws equipped with cement may provide better clinical results than those with traditional pedicle screws. After fusion surgery with CAPSI, older osteoporotic patients' clinical outcomes were deemed satisfactory based on VASs and Oswestry disability scores. Moreover, there was a notable improvement in fusion rates and a significant decrease in the mechanical difficulties brought on by the screws. Conversely, Seo JH suggested that screw fixation alone could yield satisfactory results even in the absence of bone cement; in patients with severe osteoporosis, cement augmentation may mitigate the danger of screw pull-out or loosening. The purpose of this study was to determine if, following PSF surgery, cement augmentation might mimic the functions of normal-density bone. Thus, in contrast to a control group of non-osteoporotic patients undergoing PSF surgery, the study examined the radiologic and clinical results of PSF surgery in patients with low-density spinal bones with and without cement augmentation.

Medical surgeries

Water jet machining is being utilized more and more for tissue dissection, ablation, and removal during medical operations, which mostly include tissue cutting. This is because it causes the least amount of heat damage, allows for tissue-selective separation, and minimizes blood loss. In terms of tissue types, process characteristics, tissue-water jet interaction mechanisms, tool solutions, and the development and classification of medical water jets, this paper reviews relevant studies and techniques for water jet machining in surgeries. It also highlights current research trends in hard tissue cutting and soft tissue dissection. The review begins with the historical development and the classification of medical water jet processes. Next, water jet processing of soft and hard tissues is discussed, including tissue structures and properties, mechanisms, process characteristics, tool design and applications. Following, water jet solution strategies related to tissue properties, biomimetic models, tissue-process-tool interactions, water jet mediums and devices are explored. Finally, the review highlights research gaps, challenges and future developments of water jet techniques for low trauma, high cutting efficiency and multiple surgical applications.