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Letter to the Editor

Concise Orthopedic Surgery in 21st Century

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Today orthopedic surgery is becoming progressively interesting. The rapid stride related to excellence of implants, technologies and techniques.

Implants

Orthopedic Implants mainly fabricated using stainless steel and titanium alloys for strength [1] and the plastic coating that is done on it acts as an artificial cartilage [2]. Internal fixation is an operation that involves the surgical implementation of implants for bone repairing [3,4]. In addition hemi arthroplasty and total hip arthroplasty in the elderly are in use [5]. However it must be considered the costs for implantable medical devices were estimated to have reached USD 80 billion in 2007, and orthopedic implant costs alone reaching USD 23 billion by 2012 [6].

Technologies

Adult stem cells provide replacement and repair progenies for normal turnover or injured tissues [7,8]. In the 1970s, the embryonic chick limb bud mesenchymal cell culture system provided data on the differentiation of cartilage, bone and muscle [9]. In the 1980's this cell system was used as an assay for the purification of inductive factors in bone [9]. In 1990's the new field of tissue engineering was happened. MSCs used with site-specific delivery vehicles to repair cartilage, bone, tendon, marrow stroma, muscle, and other connective tissues [10]. In the beginning of the 21st century, substantial improvements have made. The most important is the development of a cell-coating technology, which capable us to introduce informational proteins to the outer surface of the cells [9,11]. This technology could serve as targeting addresses to specifically dock MSCs or other reparative cells to unique tissue addresses. Now, the scientific and clinical challenge remains: to perfect cell-based tissue-engineering protocols to utilize the body's own rejuvenation capabilities by managing surgical implantations of scaffolds, bioactive factors and reparative cells to regenerate damaged or diseased bone and cartilage tissues. Soft tissue balance in total knee arthroplasty with a force sensor is another fantastic approach. It relies on objective dynamic data to balance the knee rather than static landmarks or subjective tensiometers [12].

Techniques

Orthopedic surgeons use both surgical and nonsurgical means to treat musculoskeletal trauma, sports injuries, degenerative diseases, infections, tumors, and congenital disorders. Computer-assisted Navigation (CAN) has a role in some orthopedic procedures [13,14]. The advantages of this approach encourage surgeons and engineers to adapt this technique to various treatments. Additionally it allows the surgeons to obtain real-time feedback and offers the potential to decrease intraoperative errors and optimize the surgical result. CAN systems could be active or passive. Active navigation systems could either perform surgical tasks or ban the surgeon from moving past a predefined zone. Passive navigation systems provide intraoperative information, which is shown on a monitor, but the surgeon is free to make any decisions he or she thinks necessary. Potential disadvantages of CAN include an increase of operative time that may be up to 20 minutes (for total knee arthroplasty), risk of fractures and superficial infection at the sites of probes insertion, need for a learning curve, delayed recovery of the quadriceps muscle, and increased cost compared with standard techniques. The risk of fractures at the sites of probe insertion has been almost alleviated with the use of novel navigation probes that use 3.2-mm instead of 4-mm or 5-mm pins. To inexpert surgeons CAN seem to be cumbrous but after the appropriate learning curve (which is considered to be the first 30 operations for total knee arthroplasty), the results and the mean navigation time are greatly improved. Delayed recovery of the quadriceps muscle has been observed after CAN with positioning of the probes within the surgical incision; this could be avoided by percutaneous positioning of the probes outside of the operating field.

Although CAN is more precise than the conventional techniques, it is still subject to errors. The tracking system of the navigation markers has an inherent error of 0.1-mm to 1-mm for each of

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the 3 coordinates in space. Also, the referencing probe may miss the intended bony structure due to overlying soft tissue or cartilage or the surgeon's inexperience. In osteoporotic bones, the probes holding the markers may move, rendering the acquired data unreliable. In sclerotic bone, even if the cutting guides are placed in the optimal position using navigation, bending of the saw blade during the osteotomy may compromise the result. If cement fixation is used, malalignment may occur due to differences of the cement mantle around the prosthesis, even though the resection level may be excellent. Many studies show improved accuracy and better postoperative imaging, but they have not necessarily made their patients any better than they would have with conventional procedures. Therefore, long-term studies are needed to prove CAN benefit.

The investigation through this letter shows, however the orthopedic surgery has extensively improved in 21st century but obvious problems to be solved such as tissues differentiation and decent tissue engineering, elimination of artifacts and optimal software development as well as cost effectiveness implants [15] and surgeons' skills [16] are still persist and must be considered before decision for a concise orthopedic surgery.

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