EDITORIAL

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Digital technology in orthognathic surgery: virtual surgical planning and digital transfer

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Orthognathic surgical planning is sophisticated and time-consuming. Traditionally, cephalometric and/or clinical surgical planning has been used, and most surgeons have chosen model surgery and handmade acrylic occlusal splints as its transfer method. Surgical treatment objective (STO), which was established by Wolford et al.[1] in 1985, is one of the most widely used traditional surgical planning methods.

Since the invention of computed tomography (CT) by Godfrey Hounsfield in 1971 and three-dimensional (3D) printing by Chuck Hull in 1983, the digital environment has been enhanced tremendously. Dental cone-beam computed tomography (CBCT) is arguably the most important advancement in oral and maxillofacial radiology[2]. Currently, patient CBCT scans and scanned images of patient dental casts can be registered (superimposed) using various software programs. The result is a 3D computerized composite image of the skull, including occlusion, which is the basis of virtual planning of orthognathic surgery. Direct digital manufacturing techniques, which is subtracting or additive one, can enable transfer of the virtual plan to the operating room using surgical guides and splints, customized plates, and prostheses.

Virtual surgical planning (VSP) or computer-aided surgical simulation (CASS) in orthognathic surgery facilitates diagnosis, treatment planning, and evaluation of treatment outcomes of dentofacial deformities and is essential for digital transfer methods such as computer-aided designed and manufactured (CAD/CAM) splints, customized miniplates with cutting and drilling guides, and navigation[3]. This paradigm shift in orthognathic surgery started in the early 2000s with Gwen Swennen, Jaime Gateno, and James Xia, independently[4,5].

Currently, most surgeons still use conventional surgical planning methods, such as clinical examination, facebow transfer and plaster model surgery, to fabricate intermediate and final occlusal wafers for double jaw surgery. VSP enables creation of multiple simulations without altering the initial model, and may also provide the clinician with illustrative images that can be shared with the patient. However, VSP is time-consuming for the preparation and requires expensive hardware and software. There are also difficulties managing dental occlusion and soft tissue simulations. VSP is not an alternative to traditional methods, but can be a useful tool to manage the most challenging cases, such as facial asymmetry and multi-dimensional deformities. Recently, a newly developed CASS program with digital transfer using customized osteotomy guides and customized miniplates has been launched in Korea; it has yielded promising results, especially in facial asymmetry cases[6,7]. Several other CASS programs for orthognathic surgery are being developed. It is likely that the shortcomings of VSP will be overcome in the near future to great benefit in Korea.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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