PREOPERATIVE SURGICAL PLANNING AND EVALUATION OF **CUSTOMIZED INSTRUMENTS AND IMPLANTS**

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As surgeons we are always looking for ways to improve the care we provide. An often overlooked yet equally important factor are the steps taken prior to even setting foot in the operative suite. Pre-operative planning is a factor that was stressed heavily during residency and fellowship, but as technological improvements are made in the implants and instruments, seldom has anyone sought to improve the way in which pre-op planning is performed. As trends have shown, patients today want individualized care, customized implants, and concierge medicine.

An important aspect of the care we provide are the steps we take to perform pre-operative planning and visualizing the surgery, anticipating the outcome and considering the patient's specific anatomy. Technology can play an important role in accomplishing this mission but has been overlooked until now. The steps taken prior to entering the operative suite can tremendously impact the operative time, patients' outcomes, anticipating anomalies, reducing invasiveness and ultimately, patient satisfaction. The past few years have seen an uptick in the availability of technology focused on customized patient-specific treatment options. However, sorting through the available technologies and evaluating them is necessary to separate the valuable from the gimmicks, but will ultimately add to the surgeon's armamentarium.

One area that has seen significant growth and interest is 3D printing and additive manufacturing. The process of 3D printing includes: implants or instruments that are built laying down metal or plastic layer upon layer until the final item is constructed. This process differs from the traditional approach of machining parts, a process where material is subtracted from a block or solid cylinder of material.

Particularly, in my practice, I have chosen to implement a new 3D printed technology, the Medacta MySpine MC system. While many companies have chosen to us 3D printing to create implants, Medacta has chosen a novel approach to utilize this new technology. It is a 3D printed guide that directs cortical pedicle screw placement via a trajectory determined through pre-operative planning. Medacta's MySpine web planning portal allows surgeons the ability to plan procedures from a 3D computerized model. Once the procedure has been planned an engineer uses the surgeon's plan to create a 3D printed anatomic model of the patient's vertebrae and vertebrae specific pedicle screw placement guide. Not only does the web-based, encrypted software give you an understanding of anatomic considerations, it also enables customized screw placement guides that match the patient's unique anatomy. These guides and models are then sent to the surgeon for the procedure. This technology allows for surgical planning to be done pre-operatively instead of use of intraoperatively. It truly bridges the gap from pre-operative planning to intra-operative execution of the plan. This is in contrast to other pedicle screw guidance systems that often add capital equipment costs and an increase of operative time for pedicle screw placement.

There are a few questions I ask myself when evaluating a new technology: Is it truly customized medicine? Does the technology aid in evaluating a specific patient condition in the process? Is there something made that is specific to this patients' anatomy? How will this technology address my patient's specific ailment? Often patient customized implants through 3D printed technology has been focused on providing a broad range of sizes to choose from. Having the ability to truly customize our care to each patient should be a focus for the future of medicine and the overall outcomes in patient care. As surgeons, we should continue to question and contribute to the improvement of technologies that advance the customization of patient specific technology.