Novel Techniques in Arthritis & Bone Research
ISSN: 2575-8888

Juniper Publishers
key to the Researchers

Editorial
Volume 2 Issue 1 – September 2017
DOI: 10.19080/NTAB.2017.02.555578

Nov Tech Arthritis Bone Res

3d Spine Surgery Techniques

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Submission: September 11, 2017; **Published:** September 19, 2017

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Editorial

Spinal instrumentation surgery - as we know today- can be traced in our modern history to early 1910. As a spinal surgeon you might face a situation where you are forced to work through a narrow trajectory bounded by vital neural and vascular structures and still need to use high speed drills, metal tabs, and screws to accomplish the mission. High grade visualization is of immense value in such situations. For the past century, surgeons and engineers have been racing to improve visualization in these types of surgeries.

By the mid 1980's the successful application of pedicle screws was a turning point in the progress of spinal instrumentation. Such screws have significant biomechanical features, and offer high versatility and solid fusion if applied properly. Furthermore, they were the corner stone for the development of more recent dynamic instrumentation techniques. Still the narrow trajectory where such screws have to travel every time they are applied was a continuous challenge to the surgeons. Initially, ordinary X-ray machines were invited to operative arena as the sole reliable visualization mode to accomplish this. Though user friendly, they still hold a trajectory failure rate of 30%. Their sole drawback was being a monoplane imaging technique. That limitation stimulated further development.

Then, Fluoroscopy came into practical use. It has been used for decades but it became reliable by 1970's when recording and playback was achievable. The use of fluoroscopy in application of pedicle screws allowed surgeons to use a biplane mode. That improved the accuracy of the instrumentation, and easiness of surgery.

Further development of the fluoroscopy to achieve a 360 degrees scanning in the form of computed tomography made it possible to get a sagittal, axial and coronal cuts of the imaged parts and allowed a better understanding of the surgical trajectory, offered higher accuracy and safer surgery. The main problem then was how to get this technology to the operative theatre reality.

Stereotaxy as a way of projecting depth to 2D images- made this dream come true. Such technology was in the hands of surgeons for the past two decades. Yet, a lot of developments to it had to develop. At the best description it is still a manufactured reality, not a true one. Coupling the radiologic images of the patient with the stereotactic machine was the main issue to improve accuracy. Surgeons started to use computed tomography imaged done preoperatively. That allowed the whole setup to be practical yet had its inherent flaws and inaccuracies.

When it became possible to operate a CT-quality imaging apparatus in the operative theatre, things got better. Coupling of such technology and stereotaxy had made a real time surgery applicable, easy to use, and with millimeters- range of accuracy achievable in the hands of today's surgeon. Marrying the accumulating surgical skills and new technologies enables us to adopt novel techniques in surgery.

DOI: 10.19080/NTAB.2017.02.555578

How to cite this article: Walid A, Riyadh. 3d Spine Surgery Techniques. Nov Tech Arthritis Bone Res. 2017; 2(1) : 555578. DOI: 10.19080/NTAB.2017.02.555578