



Editorial



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See the article “Telerobotic Spine Surgery
Based on 5G Network: The First 12 Cases”
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The Future of Spine Surgery in the Fourth Industrial Revolution: Telerobotic Spine Surgery

Spine surgery has a long tradition in human societies, with almost 5,000 years of history. Although the main advances in spine surgery occurred in the 19th and 20th centuries, advancements continue to be made in surgical techniques and indications, resulting in improved outcomes. Especially during the last 5 decades, the conceptual landscape of spine care and surgical techniques has dramatically changed, exceeding our expectations. Sometimes it seems hard to catch up with these new trends and changes.

Now we are faced with the huge new tide of the fourth industrial revolution (4IR) in all fields of our lives. Spine surgery is no exception. The future of spine care will be shaped by issues related to the 4IR, such as big data, artificial intelligence, the internet of things, robots, 3-dimensional (3D) printing, and nanotechnology. Through collaboration and integration of these new technologies in physical, biological, and digital applications, spine care will be utterly transformed in the near future.

The excellent paper “Telerobotic Spinal Surgery Based on 5G Network: The First 12 Cases” showed us new possible surgical options and possibilities for the management of spine patients in the future.¹ This is the first paper to focus on telerobotic spine surgery using the fifth generation (5G) internet, making it a real milestone in the 4IR epoch.

Several types of robot-assisted spine surgery have been introduced into clinical practice as new surgical options. Initially, the accuracy and reliability of these techniques were analyzed by several authors in comparison with freehand and fluoroscopic techniques. The improved accuracy of 2D-3D registration and combined application with a navigation system or 3D fluoroscope significantly increased the accuracy of pedicle screw positioning. Now, our concerns have moved to the expansion of the indications of these techniques to overcome their limitations, such as cost-effectiveness, radiation exposure, and applicability to the cervical spine.

In this paper, we learn about a new indication—telerobotic spine surgery—of robot-assisted surgery that is supported by 5G wireless technology. The ultra-reliable low latency communication of 5G will enable a new dawn for telemedicine applications such as remote patient monitoring and remote surgery. Furthermore, 5G technology can be incorporated into surgical robots for spine surgery, thereby enhancing the capabilities of the robots and simultaneously making them more effective.

These developments constitute a real new horizon for spine surgery in the future, and will improve the quality of spine care in practice by facilitating excellent surgical outcomes and preventing catastrophic surgical complications.

Nonetheless, it remains to be seen whether the technology incorporating extremely high-speed 5G internet connections in robotic surgery will become fully established. On one hand, it could be good for spine surgery overall, but on the other hand, it also seems like a tran-

sient expedient.

I am sure that we are transitioning into a new era of spine surgery that will be completely different from the last 2 centuries in terms of disease concepts, surgical options, and management modalities thanks to integrated new technologies that will emerge in the near future.

REFERENCE

1. Tian W, Fan M, Zeng C, Liu Y, He D, Zhang Q. Telerobotic spinal surgery based on 5G network: the first 12 cases. *Neurospine* 2020;17:114-20.



Title: Three Dancers

Artist: Pablo Picasso

Year: 1925

Picasso painted *The Three Dancers* in Paris after a trip to Monte Carlo with his wife, ballet dancer Olga Khokhlova. At this time, Picasso was attracted to André Breton's Surrealism movement. This radical work marks Picasso's entry into Surrealism and descent into his disturbing depictions of the female form. However, he was never a fully signed up member of the Surrealism movement: his down-to-earth artistic response and individuality never truly submitted to the movement's Freudian concepts of supremacy of the subconscious state. Yet Surrealists emerging from the Dada movement claimed Picasso as their own, with the reproduction of *Les Femmes d'Alger (O.J. Version O)* (1907) in their 1925 manifesto to endorse his influence on their work.

More information: <https://www.pablocicasso.org/three-dancers.jsp>

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