

Robotic surgery: an overview

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ABSTRACT

The advent of robotic surgery heralded a new era for human surgical techniques. Promising untiring, precise, remotely possible surgery, it was welcomed with open arms as the harbinger of a new revolutionary answer to myriad problems besetting the global provision of high quality, standardized surgery, extendable to remote parts of the globe. This short paper looks at the progress and achievements of robotic surgery since its inception, particularly in light of issues to its implementation in developing countries like Pakistan.

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INTRODUCTION

The definition of robots in the modern world is well established as a reprogrammable, multifunctional manipulator; designed to move materials, parts, tools, or specialized devices through various programmed motions for performance of a variety of tasks. In 1920 however, the term “robot” only meant forced labour as described by the Czech author Capek.^{1,2} Little did the Czech author know that in 60 years’ time, this so-defined forced labour will be on the brink of revolutionizing modern-day surgery.

The first robot-assisted surgical procedure used the PUMA 560 robotic system for acquiring neurosurgical biopsies with great accuracy (stereotactic brain surgery).³ It was designed to outperform hand biopsies in terms of accuracy and surgical precision. With its success, the paradigm shifted, and more research went into making of similar machines in an effort to transform manual surgery.

The greatest stakeholder in success of robotic surgery was the United States Military. It recognized the potential of linking surgeons in the home country to robots capable of performing surgery on the battle fields. Several ideas were trailed, the earliest being the Automated Endoscopic System for Optimal Positioning (AESOP) robotic platform, later on modified to ZEUS operating system, and EndoAssist. Leading the race at the time, however, was Intuitive Surgical Inc. It introduced the now well-known Da Vinci system after radically overhauling its SRI Green Telepresence system.³ The salient features of Da Vinci system were the 3D high-definition vision, up to 10 times image magnification, a wrist allowing for seven degrees of freedom of instruments and filtration of physiologic hand tremor.

Today, surgical robots enjoy an influential role in the surgical ecology. According to a report by Intuitive Surgical Inc., 1.5 million operations were performed by the Da Vinci system globally by 2013. By the end of 2013, the number of robotic systems in the United States and Europe stood at 2001 and 443 respectively.¹

Long after the advent and success of robotic surgeries, Pakistan managed to acquire the Da Vinci Surgical system in 2011 for Sindh Government Qatar Hospital; however, the machine went out of order soon after as a proper feasibility study was not undertaken before acquiring the system. Although the technology was available, the major breakthrough came two years later in 2013 when a second Da Vinci robotic system was installed in Civil Hospital Karachi. In collaboration with the Sindh Institute of Urology and Transplantation (SIUT) surgical procedures began, with more than 500 surgeries to their credit to date. The Sindh government has also played a vital role in the success of this program by providing funding for 150 cases yearly.⁴

Implying that robotic surgery will become a norm in Pakistan seems like a long shot. The fact that this technology is costly and maintaining these marvels of engineering for optimal working at a cost of 10% of their purchase value, is daunting;⁵ a luxury our country cannot afford. Albeit, if Pakistan does manage to acquire such systems, an estimated Rs 5,50,000/- is required per robotic surgery according to an author from Civil Hospital Karachi.⁴ This price cannot be paid by a fourth of the citizens of Pakistan as 24.3% of Pakistanis live below the poverty line, as estimated by the Asian Development Bank in 2015.⁶ Another hurdle for making robotic surgeries common in Pakistan would be training of personnel for operating this system. Due to the lack of infrastructure, training will be limited to particular niches, or overseas collaboration will be needed to train doctors, both of which will cost a fortune without the certainty of payback.

In conclusion, these are early days of robotic surgery. This relatively new field of surgery is continually evolving and with increased competition there is every chance that better, cheaper and more user-friendly machines will be developed. Only then will third world countries like Pakistan be able to afford this luxury and showcase their expertise in the field of robotic surgery as they have shown in surgery at large.

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