Acta Scientific Surgical Research

Volume 1 Issue 1 March 2022

Editorial

Robotic Surgery: Emerging Horizon on Crossroads

Satyendra K Tiwary*

Professor, Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India

***Corresponding Author:** Satyendra K Tiwary, Professor, Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India.

Received: April 20, 2022

Published: April 28, 2022

Alexander Pope, the famous English poet once said "Be not the first by whom the new is tried, nor yet the last to lay the old aside" [1]. This holds true even after centuries as far as every development in surgery is concerned. With development of minimal access surgery and wide acceptance for certain surgical procedures laparoscopy definitely gained wide acceptance but robotic is still at crossroads having potential for complex surgical procedures but limited by cost and complexity.

In ever changing science of medicine, technology has been always a driving force for excellency, assistance and outcome. Surgical skills always key denominator for results considering all other parameters are comparable. Developmental transition history of surgical arena from open to minimal access is only about 30 years.

Laparoscopic surgery is now gold standard for many surgery with best example being laparoscopic cholecystectomy. In minimal access techniques, laparoscopic surgery is universally accepted right from tertiary centers to remote surgical centers of villages. Robotic surgery is another feather in surgical armamentarium with its bundled advantages as well as cost and complexity is still in its burgeoning phase. What is future of robotic surgery is still a debatable issue but writing is clear on the wall about integral role of robotics in certain most complex surgeries like radical prostatectomy and Wertheim's hysterectomy. The unrivalled suturing ease and motion scaling features, transforming into greater precision, has led to its widespread application in different surgical ramifications with unparalleled margin clearance and excellent outcomes. These advantages have been transformed into an increasing number of procedures being performed by robot and that too with improved outcomes. In USA, urology and gynecology procedures are performed by robots routinely but India is also accepting this robotic surgical innovation with considerable pace and the use of which is on slow but continuous rise. Number of robotic platforms coming up in increasing numbers in many tertiary care Indian centers and a corresponding increase in demand of the same by the patients as well; thereby aptly fulfilling the economics of 'demand and supply'.

A new invention or development in any discipline is first greeted with disbelief, followed by criticism and finally acceptance. The same holds true for the robotic platform. The foremost and well-accepted critique of robotic surgery is the cost. Cost never a restraint in resource rich regions but definitely detrimental in poor and third world countries. The increasing cost of healthcare has been a matter of concern everywhere in terms of output assessment. This has led to questions about the utility of the robot, particularly in a cost conscious and limited resourced society like India. The second critique of concern is the lack of evidence-based data the form of randomized controlled trials for procedures performed robotically in comparison to laparoscopy or open approach. Both these critique needs time to settle and outweigh in terms of advantages of robotics. Similar critiques were evident during the early developmental days of endourology. The value of any new addition to the surgical armamentarium should be recognized before setting it up on a pedestal or relegating it to the dustbin. The same holds true for robotics as a new technology.

Since its very inception, surgery, has utilized human hands as most important tool for performance and hand is considered as

eye of the surgeon. Nevertheless the rise of laparoscopy had seen many eyebrows of the critics before it has reached its present day status. However, the latter has its own set of concerns in the form of limited degrees of freedom, working with two-dimensional system, transmission of physiologic tremors, the fulcrum effect and so forth. In an attempt to overcome these limitations and at the same time maximizing the benefits of minimally invasive surgery, there came the application of 'robotics in surgery'. The earlier versions such as PUMA-560, PROBOT, ROBODOC have given way to the present day comprehensive master-slave surgical robot the 'da Vinci system'.

Robotic surgery certainly has specific advantages in the performance of surgery: Magnified view with three-dimensional vision, ergonomic hand movements with full range of movements, removal of the fulcrum effect of laparoscopy, scaling down of hand movements facilitating delicate maneuvers, and minimization of hand tremors. With these advantages so strongly stressed by the robotic enthusiasts, it may appear that all laparoscopic surgery be done with robotic assistance. The reason this is a far cry from reality is the disadvantages heavily outweigh the advantages.

The larger OR space required by the humongous footprint of the robot, longer total OR time, difficulty in changing the operation table position after docking, feasibility of the surgery (by and large) only in one quadrant of the abdomen are some of the disadvantages. More important is the total lack of tactile feedback, compromising surgery, and safety. Sustrata had stressed the importance of tactile feed back to the surgeon 'the surgeon's hand is the most important instrument' [2] and Freyer in his paper on prostatectomy wrote 'the surgeon must have his eye at the tip of his finger'. In the laparoscopic era, the eye is transferred to the tip of the laparoscopic instrument.

There is, and always will be, a growing importance for the development of better robotic surgery in specific disease procedures, where it has the potential of optimizing results — as best seen in prostate cancer or perhaps cervical cancer. Proponents of robotic surgery would serve their cause best if they promoted it for niche areas rather than a 'one method for all surgery', and were factual and pragmatic in evaluation and comparison of outcomes, complications, and costs.

To be of practical benefit in a developing country, new technology must adhere to the concept of the5As: Affordable, acceptable, accessible, available and appropriate [3]. Where does robotic surgery with the down payment of two million US dollars, annual maintenance of $350,000, expensive disposable equipment, in return for safety and outcome 'comparable' or 'similar' to affordable laparoscopic in almost all procedures and to open surgery in several, hope to enter the arena. Robotic surgery is in evolution to a larger conceptual field of computationally enhanced surgery (CES) [4].

Robotic surgery is made out by the manufacturer and a few surgeons to be a 'different', 'new', 'unique' surgery. Fundamentally robotic surgery is laparoscopic surgery. The robot by placing a computerized inter-phase between the surgeon and the patient gives specific advantages to the laparoscopic surgeon in the performance of the procedure. Just as the CT scan is a computer with eyes, the robot is a computer with arms; its functionality is totally surgeon dependent. A robot, at best, will enable a mediocre laparoscopic surgeon to be a better laparoscopic surgeon, a robot does not perform surgery, it may, at best, in part compensate for surgeon deficiencies.

There are over 5000 peer-reviewed papers published on robotic-assisted laparoscopy. All of them deliver the same message. Robotic-assisted surgery is 'feasible' and the outcome is 'comparable' and 'similar' to laparoscopic, even open surgery. Laparoscopic cholecystectomy, for over 25 years has been practiced safely, quickly, and economically all over India from tertiary centers to small remote towns, even villages. Robotic-assisted surgery has been advocated for cholecystectomy. Does it make sense to downgrade a routinely practiced procedure by making it far more costly, cumbersome, time consuming just because it is 'feasible'? Surgeons have the maturity to decide what 'can' be done is different from what 'should' be done. It has been said by a thinking laparoscopic surgeon 'Once you have a hammer, everything looks like a nail'. Having a new toy does not justify our hammering or nailing all our patients.

The use of Robotic Surgery as a purported adjunct and aid to Minimal Access Surgery (MAS) is growing in several areas and has definite superiority in terms of ease, outcome and satisfaction. The acknowledged advantages as also obvious and gradually being established in urology, gynecology and surgical oncology. Many surgical training platforms are beginning to expand beyond discrete robotic skills training to procedure-specific and team

training [5]. Potential disadvantages of cost, complexity, increased operative time are taboo of Robotic Surgery. Meticulous survey, review and analysis of literature shows that while Robotic Surgery is "feasible", the results are "comparable" and it is well "acceptable" by patients as well as surgeons, there is no convincing evidence that it is superior than MAS or even open surgery in most procedures. There is definite emergence of Robotic surgery on horizon but its extent of utility and usefulness is still in transition phase confined to resource rich geographical regions of the world and may need another decade for expansion and universal acceptance.

Bibliography

1. Ganpule AP. "Is the Indian surgical arena ready for the robotic platform?" *Journal of Minimal Access Surgery* 11.1 (2015): 1.

2. Srikantha Murthy KR and Susruta Samhita. "Varansai: Published by Chaukhambha Orinetalia" (2008).

3. Udwadia TE. "One world, one people, one Surgery". *Surgery Endoscopy* 15 (2001): 337-343.

4. Singh TP., *et al*. "Robotic Surgery: At the Crossroads of a Data Explosion". *World Journal of Surgery* 45.12 (2021): 3484-3492.

5. Azadi S., *et al*. "Robotic Surgery: The Impact of Simulation and Other Innovative Platforms on Performance and Training". *Journal of Minimally Invasive Gynecology* 28.3 (2021): 490-495.