



THE DA VINCI SURGICAL SYSTEM: MODERN ALTERNATIVE TO TRADITIONAL PANCREATIC CANCER TREATMENTS

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ABSTRACT

Tumor removal surgeries can be absolutely devastating for cancer patients. Many cancer patients have extended recovery times, increased risk of infection due to fatigue, and a weakened immune system. Fortunately, modern engineering technology has paved the way for increased surgical precision through computer assisted surgical devices such as Intuitive Surgical Incorporated's da Vinci Surgical System. The device was designed to create a surgeon-controlled, minimally invasive procedure that gives the surgeon the ideal stable hand for the most precise incisions and maneuvers within the body.

Tumor removal is an integral purpose for the da Vinci System. This paper will research the viability, efficiency, and safety of treating pancreatic cancers with a da Vinci Surgical System procedure. The two main surgeries to remove pancreatic tumors are a pancreatectomy and a pancreatoduodenectomy. Pancreatoduodenectomies (Whipple procedure) remove the tumor from the head of the pancreas, whereas pancreatectomies remove the pancreas.

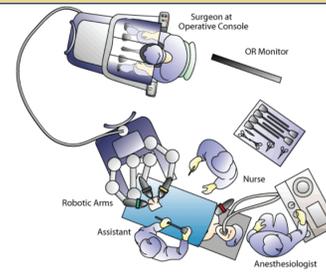
When examining the effectiveness and safety of the da Vinci System in the removal of cancerous tumors in the pancreas, this paper will explore important safety statistics such as, but not limited to: blood loss, rate of complication, and time spent in the hospital. To further analyze effectiveness, the social (quality of life) and economic (cost efficiency) sustainability of The da Vinci System must also be examined through a multitude of statistics. The da Vinci System has begun and will continue to revolutionize surgery, which will improve the quality of life for cancer patients everywhere.

Key Words—da Vinci System, Pancreatectomy, Pancreatic cancer, Pancreatoduodenectomy, Robotic Surgery

WHAT IS THE DA VINCI SURGICAL SYSTEM?



The da Vinci System's 4 Robotic Arms



Visual of da Vinci Operating Room



The da Vinci's Control System

Robotic surgery is just what it seems—surgery that involves an engineered robotic system. However, a common misconception is that the surgery is performed by the robot. Robotic surgery is how its referenced, but the procedures are truly robotic-assisted surgeries; the surgeon performs the surgery by controlling the robot. The robot is simply an advanced surgical tool that allows the surgeon to perform many complex procedures with increased precision, flexibility, and control. This paper will focus on Intuitive Surgical's da Vinci Surgical System (DVSS) and, in particular, will look into the use of the DVSS as a treatment option for cancerous tumors within the pancreas.

The DVSS is a minimally invasive robotic surgery device designed for increased surgical precision and optimal results. The paper will present findings on the safety, practicality, and significance of using the da Vinci Surgical System compared to a traditional, open surgery to remove the tumors.

The DVSS became the first FDA approved laparoscopic robotic surgical platform in 2000 and has managed to remain the most common and well known robotic-assisted surgery method. Comprised of two master control devices (Tower and Control) as well as visual and moment aids, the DVSS is a robotic-assisted surgical system that gives a surgeon the ability to perform complex, minimally invasive procedures with increased precision and accuracy.

SUSTAINABILITY

SOCIAL



ECONOMIC

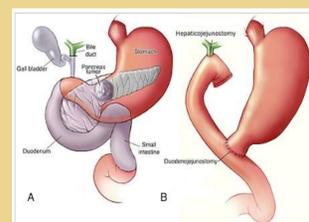
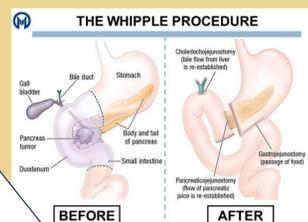


Socially, the DVSS provides a postoperative quality of life that was previously unobtainable for patients. Additionally, it gives the surgeons a higher certification and a newly established reputation due to a decreased amount of errors. This makes the DVSS unarguably socially sustainable.

Economically, a high price tag and lawsuit payouts make this product seem economically unsustainable for both producer and consumers; however, a profit return of 385% and over 775,000 procedures performed a year show that the product is in fact economically sustainable for both the consumers and the producer.

PANCREATIC TUMOR REMOVAL

The two major types pancreatic tumor removal procedures are pancreatectomies and pancreatoduodenectomies. If the cancer has not spread throughout the pancreas, a specialist would prefer to perform a pancreatoduodenectomy to remove the tumor(s). This surgery is commonly known as the Whipple procedure and its goal is to remove the duodenum, the head of the pancreas. On the other hand, if the cancer has spread throughout the pancreas the specialist would resort to a pancreatectomy, which removes the entire pancreas. Both procedures are complex and require surgeons with years of experience in the field.

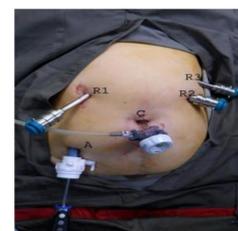
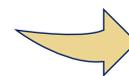


Before and after of the pancreas and surrounding areas: Whipple (left) and Pancreatectomy (right)



PROS

Comparison of DVSS to Traditional Pancreatic Surgeries



The incisions of a Whipple Procedure the DVSS (left) and traditional methods (right)

COMPARISON TO TRADITIONAL SURGERY

Precision	5x more
Hospital Stay	50% shorter
Blood Loss	30% less
Spleen Preservation	45% more
Complication Rate	35% less
Post-Op Complications	50% less
Reoperation Risk	12% less



CONS

COSTS

- A single DVSS unit costs approximately \$2,000,000
- Attachments costs roughly \$100,000 each
- A DVSS procedure costs an average of \$5,000 more than its traditional counterpart

LAWSUITS

- 10,000+ injuries or adverse events
- 0.67% occurrence
- 8,000 due to machine malfunction (recall)
- \$97,000,000 in lawsuit payouts

THE FUTURE OF DVSS



The DVSS has seen a recent spike in its stock (100% to 385%) within the past fiscal year. There were also over 775,000 procedures performed with a DVSS during that time. With comparative statistics highlighting a significant positive social sustainability the recent increase in the DVSS's popularity looks to be here to stay.

The DVSS provides patients a safer surgery and has proven to be a revolution to modern day surgeries. The data supports that the DVSS can and will become the preferred method of cancerous tumor removal procedures within the pancreas.