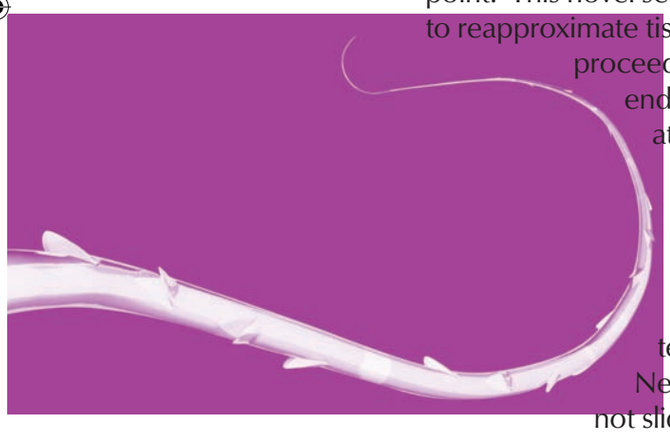
Delaware Valley Institute of Fertility & Genetics
Conceptions
Fall 2008

Knot Free Sutures and Robots

By George S. Taliadouros, M.D., FACOG

In the past barbed suture use was not met with widespread success and acceptance. This experience has been reversed recently with the introduction of new material by Angiotech Pharmaceutical Inc., a company based in Vancouver British Columbia. Quill Self Retaining System (Quill SRS) consists of either polydioxanone (PDO), nylon or polypropylene sutures that have escarped barbs into the mono filament fibers. These barbs are divided into two groups arranged in spiral configuration and facing each other from the suture's mid-point. This novel self-anchoring suture has needles at both ends and is designed to reapproximate tissues by starting at the mid point of a tissue defect and proceeding in opposite directions using the needles attached to both ends of the suture. The suture slides through the tissue until an attempt is made to pull each portion having the barbs that face the opposite direction. The barbs are then engaged by the tissue the way a suture with an inadvertently placed knot at its length, will engage the tissue. The hold on the tissue is firm with pull-out force ranging from 1.4 to 2.1 kg. Since the barbs are present at equal spaces throughout the assumed suture, tension is equally distributed across the entire tissue defect. Neither of the suture segments slide back. Since the suture will not slide back, no knot placement is needed at either end of the tissue defect.



This new application led to an enthusiastic adaptation of this technique in plastic surgery and subsequently in other surgeries. Advantages include a mere simple and faster suture placement without complications associated with conventional suture knot placement, (such as slippage, extrusion, or tissue distortion, better tension strength, and wound holding capacity).

At Delaware Valley Institute of Fertility & Genetics a study has been undertaken to assess the efficacy, effectiveness and ease of this suture placement in gynecological surgeries. We will keep you abreast of our findings.

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Surgeons are supposed to have firm hands and steel nerves DaVinci has both.

Hippocrates and the Romans developed instruments to inspect internal organs. The use of light, mirrors, and lenses to examine internal organs founded the principles of endoscopy in the 1800s, and the concept of laparoscopy was laid out in the early 1900s. In 1973 laparoscopy was first used to observe and biopsy the liver in cancer patients.

The impetus in the rising field of minimally invasive surgery (MIS) was driven initially by funding from the National Institute of Health (NIH) and the Defense Advanced Research Project Administration (DARPA), a key player in Internet development. From the three competitors in the computer enhanced MIS, one remains. The Integrated Surgical System (RoboDoc) shut down in 2005. In turn the Computer Motion that relied on NASA technology (responsible for assembling equipment from space via remote access) merged with Intuitive Surgical Devises, a Stanford Research Institute Offspring.

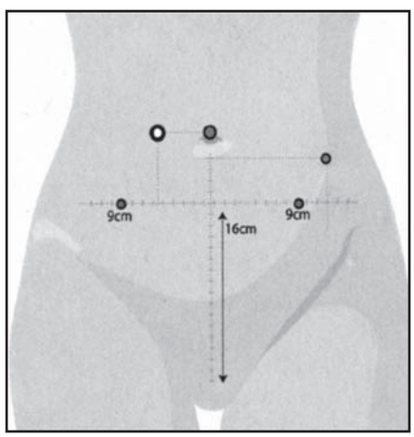
The DaVinci System is a robot that comprises three components. The surgeon's **video console**, the ***patient's side cart*** that includes four to six arms, and an **in-site vision system**.

The surgeon performs work at the **video console** from across the room where the operating table and the patient are positioned. The articulated robot arms can be fitted with microsurgical instruments (EndoWrist), such as graspers, scissors, and needle drivers.

The innovation is at the full range-of-motion that can replicate the full range of wrist motion. In 2006 a new model allowed 6 degrees of movement surpassing wrist mobility (up-down, side-to-side, in and out, rotation, pitch and yaw). Also featured are, new longer instruments with lighter arms. The master controls downscale movements 5 to 1, or 3 to 1, increasing accuracy and precision. Electronic filtering eliminates tremor completely. Therefore, the movements are simultaneous and fluid, direct and intuitive, the setting convey true ambidexterity to surgeons within minutes.

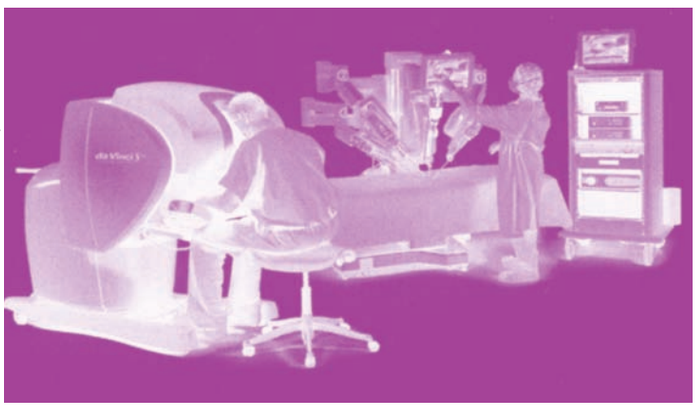
This is a far cry from the two dimensional view, the fulcrum effect, and the hand control of long instruments during conventional laparoscopic surgery, that can hamper optimal management in complicated surgical cases.

The application of multiple lenses through the same optical system allows a three dimensional imaging of the **in site vision system** rendering; for instance, the two dimensional image of the aorta into a hose. The technology is the same with the insects visual system and is still under development by the industry.



Port placement; measurements are performed after insufflation.

DaVinci prototype "Mona" was initially tested in Belgium in 1997 and after a 3-D imaging system was added, it returned to Paris and Germany where abdominal and open heart operations were performed. It was then marketed in Europe along with ZEUS before the two merged. FDA graded approval for gastroesophageal and gallbladder operations, but a major application for the system came with its approval for use in prostate cancer in June 2001 and for hysterectomies in spring of 2005, the latter surpassed the former, by a factor of five.



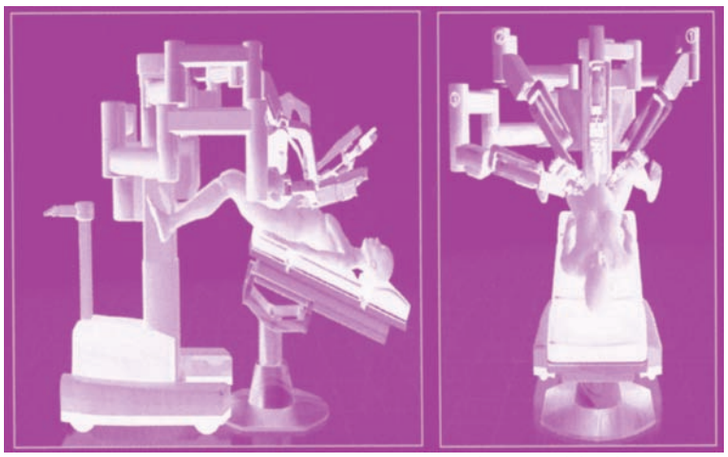
The da Vinci Robotic System. From left to right: surgeon's console, patient-side surgical cart, and InSite vision tower.

Four accession sites or "ports" are usually made for the robotic gynecological surgery, three for the robotic arms and one for the surgical assistant. Through the umbilical incision a 12 mm trocar is placed with open Hasson technique, then two 8 mm trocars are placed 9 to 10 cm at each side of the umbilicus, either cephalad or caudally. A 10 to 12 mm trocar is placed 3 to 6 cm lateral and cephalad of the umbilicus for use by the surgical assistant. A fourth robotic arm is placed in complicated places for tissue retraction using the robotic instrument called ProGrasp. The placement of the "ports", other

than the umbilical one, varies among surgeons. Nonetheless, it is designed to allow enough space for the surgical assistant to complete the assigned tasks, such as irrigation, suction, vessel sealing, tissue retraction, and specimen retrieval.

More than 800 DaVinci systems are now in use worldwide and 85,000 surgeries were performed last year, a 75% increase since 2006. That is more than 1000 surgical cases per unit. An optimistic projection is a 50% growth in the number of cases per year.

The start up cost is considerable, 1.1 to 1.65 million, somewhat higher than that of ExAblade. The learning curves are also higher with this technology, as are the cost of certain operations with this technique, when compared with conventional standard operations. Nonetheless, DaVinci Systems is not a technology in search of application. Table 1 is a list of procedures that now are routinely performed in some surgical centers



Patient positioning.

TABLE 1

Mitral Valve Replacement
Coronary Artery Bypass Graft (CABG)
Aortofemoral Bypass
Aortic Aneurysm Resectomy
Heller Myotomy
Esophagectomy
Pancreatectomy
Pyloroplasty
Prostatectomy
Hysterectomy
Myomectomy
Sacrocolpopexy
Lymph Node Dissection

Gynecological suture intensive procedures and procedures requiring meticulous dissection close to major vital structures seem to favor the use of DaVinci. Radical hysterectomy with lymph node dissection, hysterectomy with history of extensive pelvic adhesions, advanced endometriosis, and the need for concomitant pelvic floor repair are the procedures that lead the way. Shorter sutures and LapraTy suture clips eliminate the need for intracorporeal knot tying, thus shortening the operating time. Currently the surgeon and the console are at the operating room, or at a nearby location. This is due to the lag times caused by transmission delays over long distances which limit the effective range to 30 miles by wireless communication and to 200 miles by cable connection, not to mention unreliability of network communications. Real-time transmission will make it possible for a surgeon in California to operate on a patient in New York. Presently a surgeon can operate from his location in different operating rooms within the constriction mentioned above.

Technologies under development will change the way we perform surgical procedures in the future. Natural Orifice Transluminal Endoscopic Surgery (NOTES) is one of them.

Birthdays continued from back page

Laila Grace, Calli Therese, Giana Renee, Jack Anthony, Born March, 8, 2008 To Lisa & Anthony Venzon
Gabriella, Born February, 28, 2008 To Jacqueline & Philip Koren
Fiona, Born February, 27,2008 To Aimee & Michael Sprouse
Carly, Christian, Born August, 23, 2008 To Jennifer & Howard Taylor
Toby, Born February, 22, 2008 To Denise & Fred Netzer
Casey Rose, Born April, 11, 2008 To Dana & Thomas Schuler
Antonio, Born May, 23, 2008 To Nadia & Richard Kulak
Jacob Ralph, Born April, 29, 2008 To Jessica & Jason Jones
Brielle Jo Lynn, Born May, 13, 2008 To Kristen & Rafael Alaba
Emma Frances, Alivia Marie, Born January, 23, 2008 To Ann & Michael Wallace
Anthony Nicholas, Born May, 07, 2008 To Theresa & Franco Paparo
Theodore William, Born April, 23, 2008 To Elizabeth & Theodore Adams
Rylee Jaclyn, Born April, 22, 2008 To Christina & John O'brien
Emily, Born June, 16, 2008 To Lolita & Emmanuel Koffa
Neel, Born April, 23, 2008 To Vidya Iyer & Patanjali Shukla
Charlie, Austin, Born May, 5, 2008 To Eugenia & William Moldt
Noah John, Born June, 9, 2008 To Charlene & Eric LaNe
Elijah William, Born July, 10, 2008 To Mindy & Brian Barnes
Veronica Jeannine, Born July, 7, 2008 To Jeannine & Wayne James
Max Daniel, Born July, 6, 2008 To Jodi & Phillip Richter
William Antonios, James Theodore, Born May, 28, 2008 To Kim & Theodore Kantarakis
Tai Chelle, Born June, 28, 2008 To Michelle & Tai Yon Anderson
Samantha, Jasmine, Born July, 23, 2008 To Andrea & Samuel Morales
Maxwell Joseph, Born August, 19, 2008 To Lori & Ted Scabarozi
Daniel Alexander, Born August, 23, 2008 To Sonya & David Lopez
Vincent Lorenzo, Julianna Rose, Born January, 2008 To Karla & Hector Luciano

All of the babies and parents are doing well. Thank you, DVIF&G!

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Happy Birthday to . . .

Lauren, Born October, 11, 2007 To Kim & Al Thomas
Jolie, Jaden, Sydnee, Born November, 13, 2007 To Nancy & Elvis Alvarez
Thomas Charles, Born November, 29, 2007 To Kelli & Thomas O'donnell
Zuri Wynter, Born December, 5, 2007 To Melanie & Rodney Stevenson
Isabella Rose, Born December, 12, 2007 To Francesca & Stephen Eory
Ashley, Born December, 27, 2007 To Amy & John Karbiwnyk
Stephanie Elizabeth, Born February, 09, 2008 To Julie & George Hope
Khoa Nguyen, Born February, 18, 2008 To Ha To & Long Nguyen
Larry Curtis III, Born January, 16, 2008 To Joyce & Larry Pompper
Maxwell John, Jason Edward, Born January, 17, 2008 To Jennifer & Michael Emerle
Nadia Catherine, Born February, 14, 2008 To Christine & John Martynick
Nolan Daniel, Born February, 15, 2008 To Caren & Mark Burgoon
Alicia Morgan, Justine Aurora, Born March, 01, 2008 To Sara & Ercole Chila

George S. Taliadouros, M.D., FACOG, medical director of DVIF&G.