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Minimally invasive surgery has many benefits including minimizing surgical trauma, improving cosmetic results, decreasing hospital length of stay, decreasing post-operative pain, increasing rate of recovery and assuming normal life style faster.

There have been many developments in minimally invasive surgery, such as minimally invasive direct coronary artery bypass, off-pump coronary artery bypass, minimal access valve surgery, so on and so forth.

Eventually, *totally* endoscopic procedures were developed. There are many challenges to having to operate using very small surgical incisions as a result of less direct cardiac visualization, variation of surgeons' experience, and the possibility of having to switch to traditional form of surgery in case a complication arises.

Robotic surgical systems are vehicles for minimally invasive surgery; so far there are two kinds. The ZEUS Robotic System is yet to be approved by the FDA and is still undergoing clinical investigation. The other one is the Da Vinci Robotic system that has been approved by the FDA for applications in internal mammary artery takedown, closed chest mitral valve repairs and atrial septal defects closures.

These robotic systems allow surgeons to manipulate the instruments in precise, real time movements, with the dexterity of the human wrist, while filtering our tremors. They can have to four robotic arms. One of these arms manipulates the endoscopic camera, while the others are used to provide control for surgical instruments. A monitor allows the surgeon to view the surgical field in 3-D.

The American Association of Thoracic Surgery has developed a set of guidelines to train surgeons.

An application of minimally invasive surgery is in the trans-catheter closure of ventricular septal defects. VSDs can occur as a result of deficient growth or failure of fusion of its various components. It can also be a result of cardiac trauma.

A catheter is introduced into the heart by cardiac catherization. It is then snared and pulled out from another blood vessel.

The Amplatzer Septal Occluder is used as a disk to block the VSD and is deployed when in place. The occluder is made from nitinol, a shape memory alloy composed of nickel (55%) and titanium (45%). It consists of two disks with an interconnecting waist.

Studies and experiments have shown that transcatheter closure is safe and effective on selected cases of VSDs.

References:

- Annals of Medicine
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- Circulation
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- American Heart Journal