Ultrasound Guided Central Chemotherapy Port Insertion by Surgeon in Cancer Patients.

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Abstract

Purpose: The aim of the study is to report early experience in ultrasound guided central chemo port insertion by surgeons in cancer patients who required chemotherapy.
Materials and methods: The procedure was carried out in operation theatre under local anesthesia with intravenous sedation. Linear high frequency ultrasound probe was used to visualize and cannulate left or right internal jugular vein in the neck. The reservoir was kept through a separate incision over anterior chest wall.
Results: Fifty patients with mean age of 48 years underwent chemo port insertion. The indications were neoadjuvant, adjuvant and palliative chemotherapy in 30%, 58% and 12%, respectively. Cannulation was successful in 100% of cases. Two patients (4%) required port removal due to wound infection (one patient) and blockade (one patient). One patient (2%) had kinking of the catheter which required repositioning.
Conclusion: Ultrasound guided central chemo port insertion by surgeons is a safe procedure with 100% success rate and minimal complications.

Key words: *Implantable venous access devices; central chemo port; chemotherapeutic agents.*

Introduction

Chemo port is an implantable vascular device designed to deliver drugs especially chemotherapeutic agents directly to the central venous system. Patients on chemotherapy need repeated venous assess. Frequent use of chemotherapeutic agents through a peripheral vein result in collapse of veins after few doses and it makes subsequent venous access difficult requiring multiple punctures[1]. This becomes troublesome to both the care providers and care receivers. Chemo port has addressed this issue. The use of chemo port is not limited only for delivery of drugs, it can be used to draw blood samples for investigations and also can be used to deliver fluid and nutrition[2,3]. In comparison to other vascular access devices, chemo port can be placed safely for longer duration.

To start with, chemo port was placed by a surgeon. Later on, interventional radiologists also have started to place chemo ports. With widening use of imaging techniques in different surgical fields, surgeons have been routinely using imaging modalities in

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different surgical procedures[4]. Ultrasound guided chemo port placement is one good example of use of imaging techniques in surgical procedure.

Chemo port can be inserted in different veins that include basilic veins, cephalic veins subclavian veins and internal jugular veins. But it is more often placed in large neck veins, preferably in right internal jugular vein due to easy access and relatively shorter and straighter route[5]. Ultrasound is used to locate and puncture the vein. This avoids multiple punctures and also minimizes complications related to it.

The purpose of this study is to report early experience in ultrasound guided central chemo port insertion by surgeons in cancer patients who required chemotherapy.

Materials and methods

This is a prospective analytic study. Patients who were diagnosed to have cancer and who were planned for chemotherapy were counselled for chemo port insertion. Those patients who were ready for the procedure were taken up for study. Consecutive patients were enrolled for study. An informed consent was taken prior to the procedure explaining all the pros and cons of the procedure. Permission from institutional review board was taken to conduct the study.

The procedure was carried out in operation theatre under local anesthesia with intravenous sedation. Routine hematological and biochemical investigations including bleeding profile were obtained prior to the procedure. Patient was kept supine with a bean bag placed underneath the shoulder with mild head down (20-30 degrees) position. Neck was tilted to opposite side. Proper aseptic environment was maintained. After proper painting and draping, a linear high frequency ultrasound probe (7-14MHz) was used to access right/left internal jugular vein. After identifying the vein, the vein was punctured using a puncture needle provided in the chemo port set. After confirming the puncture of vein on ultrasound, a guidewire was introduced through the needle into the vein and this too was confirmed on ultrasound. An incision around 3-4 cm was made on the chest wall in infraclavicular area and a pocket was created beneath the subcutaneous fat plane to place the reservoir chamber. A tunnelling rod was used to pass the catheter from the chamber to the neck puncture site. Finally, the catheter was introduced into the internal jugular vein through the guidewire using Seldinger technique and the position of the tip was confirmed on fluoroscopy. Lastly the chamber was secured in place using polypropelene suture and the incision was closed in two layers. The chamber was flushed with heparinised solution at the end of the procedure. A check CXR was done to re-confirm the position of the whole system at the end of the procedure. A booklet with the details of chemo port and details of patient was provided to each patient. Before each infusion, patency of port system was checked by confirming blood return using a 10cc syringe. At the end of infusion, the system was flushed with 10ml of heparinised solution. If not in use, the port was flushed with 10ml heparinised solution every month.

Results

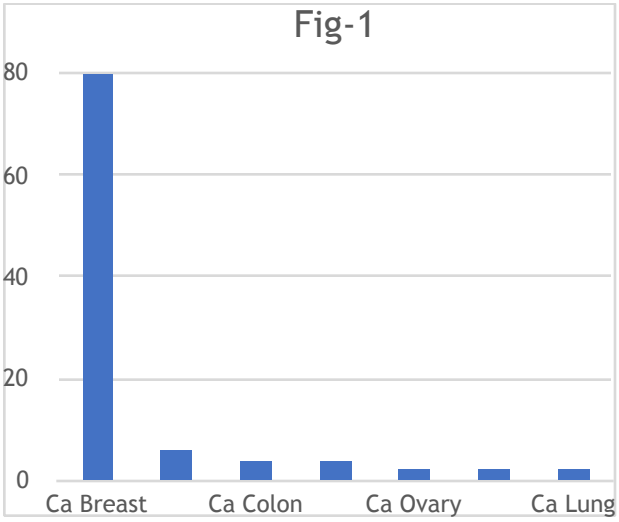
Fifty patients underwent the procedure. The age of the patient ranged from 22-85 years with mean age of 48 years. 3 patients (6%) were males and 47 patients (94%) were females. Chemo ports were placed in each patient for delivering chemotherapy. The

purpose of chemotherapy was neo-adjuvant, adjuvant and palliative (table-1)

Table-1: neo-adjuvant, adjuvant and palliative

Neoadjuvant	30%
Adjuvant	58%
Palliative	12%

Most common diagnosis was carcinoma of breast (fig-1).



There were patients from each stage. 2% of patients were in stage 1, 38% in stage II, 46% in stage III and 14% in stage IV.

32% of the patients have co-morbidities (table-2).

Table-2: Associated Morbidities

Hypertension	14%
Diabetes	8%
Hypertension + Diabetes	6%
Hypothyroidism	4%

Average procedure time was 30 minutes. Puncture was a success in 100% patients (table-3).

Table-3: Attempts of Puncture

Single attempt	62%
Double attempts	28%
Tripple attempts	10%

Complications included infection, kinking requiring repositioning and blockade requiring removal (table-4).

Table-4: Complications

Infection	2%
Kinking requiring repositioning	2%
Blockade requiring removal	2%

Discussion

Many oncology patients on chemotherapy require long-term venous access for the administration of intravenous medication, nutritional therapy, and the withdrawal of blood[1,2]. Conventional venous access through peripheral veins in patients under chemotherapy becomes difficult after few cycles of treatment as most of the chemotherapeutic agents result in venous toxicity. This led to the invention of implantable venous access device. The first totally implantable venous access device was performed by Niederhuber and colleague in 1982[6]. Since then, the systems have increasingly been used in the field of oncology. The devices, now commonly known as chemo ports or port-a-cath are even used for taking frequent blood samples, for total parenteral nutrition and for fluid and factors replacement. These are cosmetically

acceptable with no restrictions in normal activities[7]. In early days the implantable devices were placed using venous cut down technique but later Seldinger technique has become the technique of choice[8,9].

Patients may encounter several complications during the procedure which are listed in table-5[10,11].

Table-5. Complications.

Immediate complications	Delayed complications
Pneumothorax	Skin necrosis
Pocket hematoma	Catheter fracture and embolization
Malpositioning	Pocket infection
Malfunctioning	Systemic infection
Bleeding	Venous thrombosis
Arrythmia and cardiac perforation	Catheter disconnection and occlusion
Arterial puncture and hemothorax	Failure to localize point
Embolism	Failure to take blood samples
Thoracic duct injury	Extravasation of fluids
Brachial plexus or phrenic nerve injury	
Arteriovenous fistula	

Overall reported complications rate is quite low. Literatures mention arterial puncture in 2-4% of patients resulting in arterial injury in 0.1-0.5% cases. Major complications such as air embolism, hemothorax, brachial plexus injury and pericardial tamponade have been reported in some case series reports. Chances of catheter fracture with fragment dislodgement is reported in 0.2-1% of cases[12]. In our studies the above-mentioned complications were not noticed. High chances of complications in certain studies may be due to use of blind techniques to puncture the vein. Furthermore, the materials used in present days result in less tissue reactions that owe to lesser complications.

When comparing subclavian vein approach with right internal jugular vein approach, studies have suggested that success rates were higher in IJV approach. Furthermore, immediate and early procedural complications were also low in right IJV approach[13].

In our study, there were no immediate or early procedural complications. In total, only 6% of our patients had complications in the form of infection (2%), kinking (2%) and blockade (2%). Only patient that had blockade (2%) required removal of the port.

Right internal jugular vein has a shorter and straighter course to the heart and hence it is the preferred vein of choice for central chemo port insertion. Puncture of right internal jugular vein does not result in rise of intracranial pressure[14].

Ultrasound is a portable system and is very easy to use. Basic ultrasound training has been a part of curriculum for surgical residents in most of the post graduate institutes of our country. Hence, surgeons are being able to use ultrasound routinely in different fields of surgery[4]. Venous access during chemo port insertion using ultrasound has thus been easy for surgeons and the high success rate in our study is basically due to proper use of ultrasound during the procedure.

In our center, due to the high cost of the devices combined with the costs of the procedure, there is very high discrepancy between those receiving chemotherapy and those undergoing this procedure. Companies are lowering down the costs of the devices

and we hope the number of patients will increasing in near future.

Conclusion

Ultrasound guided central chemo port insertion by surgeons is a safe procedure with 100% success rate and minimal complications.

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