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Original Research Article

Chemotherapy port placement in breast cancer patients in a resource constrained setting: hurdles and outcomes

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ABSTRACT

Background: Safe long-term venous access is essential in cancer undergoing chemotherapy, bone marrow transplant or supportive management in some conditions. Implanted devices are of choice here but under-utilised. Our review focuses on evaluating the reasons for this underutilisation so as to promote the use of chemo port in specific situations.
Methods: 245 patients undergoing port placement in a socio-economically constrained zone were analysed with regard to multiple clinical, social and logistical parameters and long-term follow-up assessed.
Results: Solid malignancy was the most common indication for port placement followed by hemato-lymphoid cancers. Breast cancers are the commonest solid cancer for Port placement. In our evaluation patients having chemotherapy ports were less worried about the upcoming chemo procedures because of the ease of IV access, resulting in better compliance and quality of life. Cost of the device and absence of expertise for placement and handling were the primary reasons for reluctance of port placement. Port related complications were few, not life threatening, and insignificant in the long term.
Conclusions: Placement of a Chemotherapy port is a technique with an easy learning curve and a good safety profile. Procedural and long term complications are few and acceptable. Costs are acceptable in the long term and are beneficial to the patient. This method to needs to be promoted in patients needing long-term venous access. Adequate training will promote acceptance and use of the chemo-port. Clinicians should adopt and offer this for all indicated patients.

Keywords: Chemotherapy port, Breast cancer

INTRODUCTION

Modern cancer treatment is multimodal and chemotherapy is an essential part of it. But establishment of a reliable intravenous access (IV) is a painful part of treatment for all patients. This becomes more important if the patients need repeated IV access over short or long duration of time or when only limited points for IV access are available, example: patient operated for breast cancer who has undergone axillary dissection, more so if bilaterally where one or both the upper extremities are unavailable for IV access. Similar is the situation with upper limb flaps, burns, trauma, previous IV extravasation injuries etc. Gaining and maintaining IV access can also be difficult if the patient is Neutropenic, having low platelets or coagulopathy or is hemodynamically compromised. Also, many patients need chemotherapeutic agents to be transfused in a constant infusion over days. Example: 5-flurouracil infusions over 48-72 hrs as needed in colonic and gastric malignancies. Here again, the access has to be reliable and sturdy to last over the need period. Total Parenteral nutrition infusions in compromised patients, blood transfusions in paediatric patients, patients not cooperative for IV access for multiple reasons like- small children, psychiatric patients, apprehensive patients afraid of multiple pricks all present similar needs for IV access.

Hence, administration of chemotherapy needs an intravenous access which is safe, reliable, re-accessible, comfortable and affordable to the patient and easy to place, handle and to remove for the health personnel.

Venous access devices can be central or peripheral, depending on the veins they are placed into. Peripherally inserted central catheters are inserted in forearm veins but have the tip opening in the SVC. Tunnelled venous access devices (Hickman, Port) have separate skin and venous access points and can be kept for relatively longer duration with lesser chances of infective complications. Port is a completely implanted tunnelled central venous access device, needing cutaneous puncture to access.

Chemo-port was first introduced by Niederhuber in 1982 into clinical use.[1] The port system is built of a central catheter, which is tunnelled and inserted into a cannulated vein beneath the skin and attached to a port chamber that is placed into a subcutaneous pocket. Access to this totally implanted reservoir is possible with a special non coring needle that allows puncture of the skin and silicone membrane of the port chamber. Chamber puncture implies central venous access and has to take place under sterile conditions.

Use of chemotherapy ports is standard part of treatment in the western world, especially in patients with need of multiple time venous access. These devices have become the cornerstone of modern medical therapy in oncological practice.[2] Use of chemo-ports is also common in India but not in a generalised manner.8 Multiple areas with geographical, socio economic, and other boundaries still are slow at adaptation of this device.

Objectives

In this study, we assess the outcome of patients who have port placement done in this socioeconomically compromised population zone. Focus is on breast cancer patients as it is high in incidence and is the commonest indication for port placement. Comparing the outcomes with the best in the world, an attempt is made, firstly to establish the feasibility and safety of this device and secondly to understand the factors which affect the generalised acceptance of this device in resource constrained areas with an aim to outline the points to promote its use in all indicated patients.

METHODS

This is an observational and a cross-sectional study of all cancer patients who have got chemotherapy port placement done over a 4 year period in the area around central Maharashtra in India.

Inclusion criteria

Breast cancer patients, needing chemotherapy and having chemotherapy port placement done. Patients diagnosed and treated between January 2017 to December 2020 in and around the geographical region of central Maharashtra in India. Patients with follow up available till at-least 1 year from the date of port placement.

Patients with port placement done for reasons other than breast cancer were excluded to make analysis of patient outcomes comparable. The data was tabulated and stratified with following parameters:

Date of port placement. Experience of the performing surgeon. Procedure type- with primary surgery or separately for port. Intra-operative issues, complications. Use of ultrasound guidance for port placement. Anaesthesia- local versus general. Day of starting chemotherapy after port placement. Post operative complications. Need for, timing and reason for port removal. Patient satisfaction. Personnel handling the port. Patient demographics

The data was compiled and analysed in Microsoft excel.

234 patients undergoing a chemotherapy port placement were outlined. 76 patients needing port for reasons other than breast cancer were excluded and 158 patients included in this study. Patients were telephonically and personally communicated for their experience. The performing surgeon and the staff handling the port were also questioned for the indications, associated difficulties and complications. The analysed data was evaluated in comparison with available Indian and international literature.

All chemotherapy port placements were done by Oncosurgeon with appropriate training and experience in the procedure. The operating rooms were well-equipped with portable ultrasound and C-arm at disposal. Experienced anaesthesia teams managed their part. Single dose preoperative cephalosporin was used in most patients.

We use 9.6 fr port in adult patients and cannulate the Right interior jugular vein as a standard.[2] Most of the ports were placed on anterior chest wall in a subcutaneous pocket. The chamber was placed in a pre-muscular subcutaneous pocket and held in place with a three point fixation to avoid twisting or migration.[3] The Internal Jugular vein was punctured percutaneously with a 24 g needle as a pilot. Once the position was confirmed, an 18 g needle was placed and vein cannulated with guide-wire. This step reduced indverent arterial and pleural punctures. The previously tunnelled port catheter was placed with a modified Seldinger technique using a peel-off dilator and introducer. Patients needing multiple pricks for cannulating, accidental carotid punctures, formation of local hematomas etc were labelled as difficult cannulation. Left side port placements were also noted. The need of Ultrasound guidance for cannulation was also documented.[4] All port positions were confirmed by adequate and smooth back flow of blood and prograde flow of saline. C-arm was additionally used to confirm the

position. Additional intraoperative complications if any were documented. Optimum position of the catheter tip in distal SVC was achieved and a post operative chest x ray was done to confirm position and to rule out pneumothorax or hemothorax.

Timing (days) of starting the chemotherapy after port placement was documented. The health professionals handling the port after placement and their experience and difficulties were noted. Inability to cannulate the port, port blockage due to thrombosis and other reasons were noted. The oncosurgeon intervened in case of difficulties to cannulate the port. Surgical site infections and systemic sepsis associated with port were also noted. Some unfortunate patients needed removal of the port. The reasons for port removal and timing of the same were assessed and documented. Finally patients were asked to grade their overall experience on a scale of 1 to 5, with 5 being most satisfied. All the responses were tabulated.

RESULTS

158 patients undergoing port placements for breast malignancy over the time period of 4 years over January 2017 through December 2020 were enrolled for the study.

Figure 1: Density plot-age.

Mean age of the patients was 56.04 years with youngest being 32 years and oldest 77 years. 42 % (n=67) patients had some medical co morbidity in the form of Diabetes, Hypertension, Cardiac disease, asthma etc.

17 patients (11%) had the port placement done under local anesthesia while 141 patients (89%) needed general anesthesia for the procedure. Among the 141 patients needing general anaesthesia 125 patients had the port placed during the primary surgery for breast malignancy. GA was needed in 16 patients when port placement was done as a separate procedure. Out of 35 patients getting port placed in a separate procedure, 17 could get it done under local anaesthesia. (Figure 2)

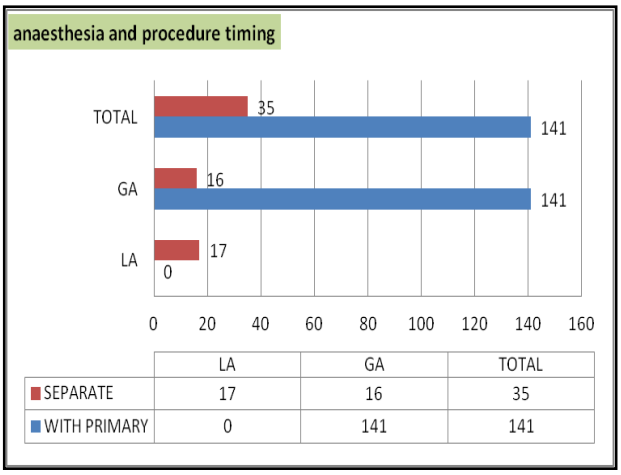

Figure 2: Anesthesia procedure timing.

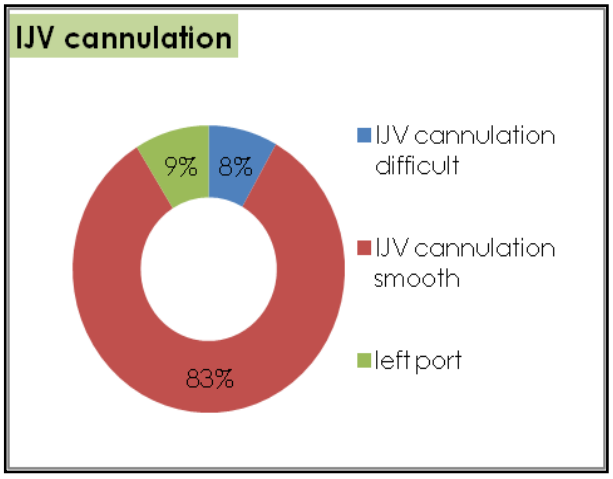

Figure 3: UV cannulation.

Chemotherapy could be started within 2 days in patients when port was placed as a separate procedure (neo-adjuvant or adjuvant).

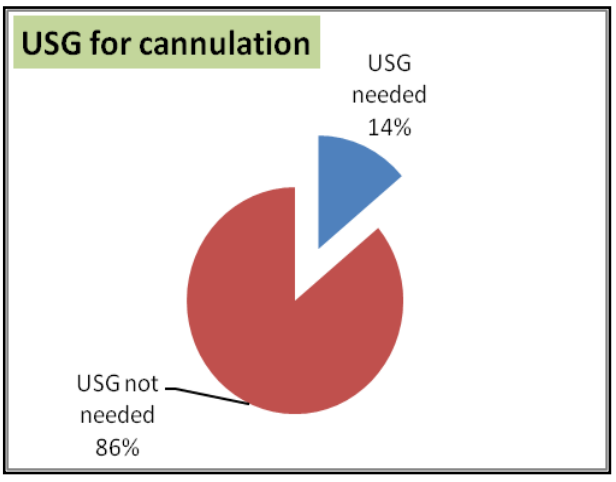

Figure 4: USG for cannulation.

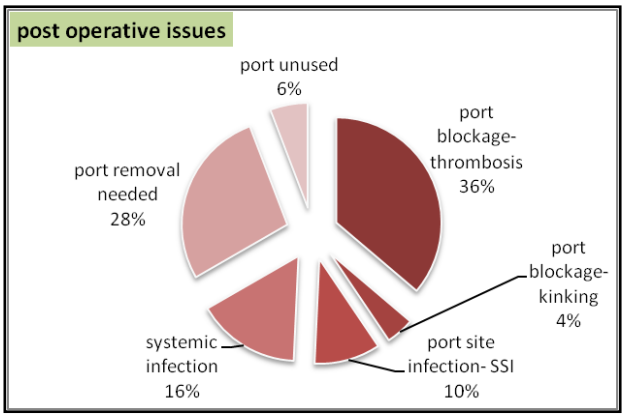

Figure 5: Post-operative issues.

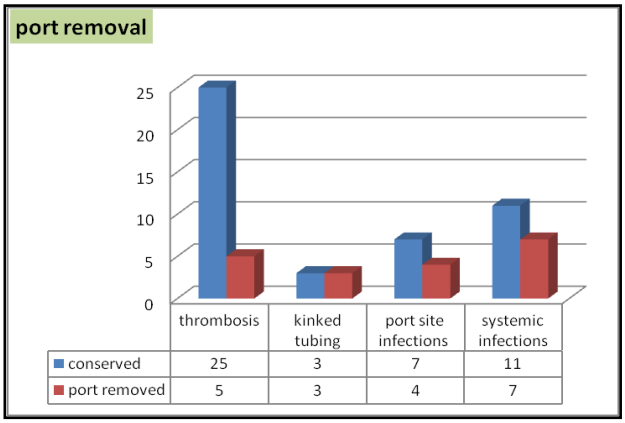

Figure 6: Port removal.

When patients had port placed during the primary surgery, Chemotherapy was started average 19 days later (time allowed for the histopathology report and wound healing).

Most of the patients had a high level of satisfaction with the port placement (score 4.3/5 mean). Patients who spent on the port but could not use it or had it removed for various reasons were relatively unhappy with the exercise (score 2.9). In our patients, 30 % of patients who had the port removed got a port reinserted and used it eventually.

DISCUSSION

Chemotherapy is an essential part of breast cancer management. Post axillary clearance, the ipsilateral arm is not used for chemotherapy infusions as it is associated with increased incidence of infections, vein thrombosis and lymph oedema.[11,13] Peripheral venous infusions are known for chances of extravasations and related complications. The problem of IV access is accentuated in patients having bilateral breast cancers, obesity, upper-limb trauma, burn wounds etc. Chemotherapy ports are tunnelled totally implanted venous access devices which are known to ease the IV access reliably and for a long term. The hyperosmolar chemotherapy drugs are immediately diluted in the high-volume vein causing minimal endothelial reaction and related complications.[9]

The findings in our study show that most of the patients who had the chemo-port were very satisfied with it. Their anxiety about upcoming chemotherapy was greatly alleviated as there was no need for multiple venipuncture attempts, leading to an overall improvement in treatment acceptance and eventually quality of life.

Peri-procedural complications in port placement were very few and easily manageable with no long term morbidity or any mortality. Most of the patients had port placement during primary surgery, reducing need for a separate anaesthesia. Even when needed as a separate procedure, many patients underwent the procedure under local anaesthesia.

Very few patients had port site infections in spite of minimal use of IV antibiotics. Port thrombosis was not very frequent and managed in most patients with heparin infusion and flushing. Systemic infections related to port were also infrequent, though needing port removal in most of the affected.

Port removal was needed in 19 patients out of 158 (12%) patients. Most of the port removals were after use of the port for 1-3 cycles of chemotherapy (Figure 6). Four patients (2.53%) had port unused for chemotherapy infusion absolutely secondary to lack of expertise to handle the port. Only three patients (1.89%) had the port removed before being used for chemotherapy even once. These findings corroborate well with other studies in Indian and international literature.[4,8,10]

The reluctance factors

Almost 830 breast cancer patients were registered over these 4 years. Leaving aside the group not needing chemotherapy, all patients technically needed port. The patients under study are only 19% of all breast cancer patients treated in the same region during this time period, which implies that more than 70% patients who potentially needed a chemo-port did not eventually get it.

The primary factors reaching to this end which were observed in this study were-reluctance by the treating surgeon/ physician to advise or perform port placement, upfront cost of the port device and the procedure, unavailability of trained professional to handle the port and fear of complications of port-short term and long term.

Port placement

Port placements procedures need some training. Most surgeons are adapted to cannulating the Internal jugular vein or the subclavian vein. Creating the port pocket, tunnelling the catheter and the peel-off Seldinger technique needs training. ‘You do not appreciate a procedure until you are trained to do it’ This sentence sums up a major reason for reluctance of the use of chemo port by most surgeons. Many Surgeons treat breast cancers but are reluctant for port because they are not trained for it.

Surgeons who are not trained or have never managed ports are not expected to advise for the same. Unavailability or inability to use ultrasound to cannulate the vein and C-arm to confirm position adds to the reluctance. Additionally, there is a fear of complications like haemorrhage, pleural trauma causing pneumothorax, port site infections and need for port removal.[5,13]

This study done in a semi-urban/rural region demonstrates that major life threatening perioperative procedural complications are minimal. USG is welcome if readily available but is infrequently needed and a radiologist can help out in case of need fluroscopy with a C-arm is essential and is usually available as urologists and orthopedicians essentially need it and most theatres are equipped. Use of a pilot puncture with a 24 g needle reduces chances of inadvertent carotid or pleural punctures. A prompt pro and back-flow and rhythm changes on ECG monitors usually confirm port position. C-arm fluoroscopy confirms catheter tip position and rules out misplacement, pneumothorax or hemothorax.[7] It is especially important in left sided port placements, subclavian vein ports and difficult cannulation situations.

Though not a part of the standard teaching curriculum yet, many institutes now provide short duration training for port placement. Online sessions or procedure videos are easily available for the aspiring surgeon to learn this technique.

Port handling

Handling the port needs patience and diligence. The staff who cannulates the port needs to be formally trained and the surgeon should be personally present for back up till he is assured of the same. Strict attention to asepsis is at the heart of cannulating the port. Poor handling is the root cause of port related infections which may eventually need port removal.[4,8] Our study shows that port related infections are few in number and related to situations related to poor handling. We had four patients who had port placed but received chemotherapy where there was no expertise available to cannulate the port.

Procedure followed at our institute is to aseptically clean the port site with 10% povidone iodine solution 6 times before cleaning the skin with spirit (to allow one minute standing time for povidone iodine). The site is draped in sterile sheets and the needle inserted with a no touch technique. The puncture site with a needle is covered with a sterile pad and a close dressing is applied. The port needle is kept in place for a maximum of 7 days at a stretch if needed. When not in use, we follow practice of flushing the port every 3 months as recommended.

De-cannulating the port needle

Port thrombosis is a completely avoidable complication. After completion of chemotherapy the port lumen needs to be flushed with heparinized saline before removing the port needle. Prompt execution of this simple manoeuvre mitigates thrombotic blockage of the port. At our institute, the last infusion is 100 ml of NS with 1000 units of heparin. The port needle is removed in flow after more than half of this infusion is done.

Port infections

These are infrequent if the ports are inserted well, and handled properly. Every puncture of the port diaphragm is an invasion of the central systemic circulation, in presence of a foreign body. Port placements have to be covered with a peri-procedural antibiotic.[9] Port cannulation does not necessitate an antibiotic cover but has to be done aseptically. Port infections may present with PUO or sometimes as fever and rigors on port cannulation and use. Long term systemic antibiotics guided by blood culture and sensitivity results are recommended in systemic infection situations, though many patients eventually respond only to port removal.[12,13]

Port cost

Upfront port placement costs involve- cost of the port device and cost of the procedure.

In our region port costs have come down from Rs.15000 to Rs.17000/- two years back to almost Rs.8000/- to Rs.10000/- per device with many new manufacturers coming up with cheaper solutions. The disposable huber-tip needle needed for each puncture costs Rs. 350/- to Rs. 500/-.

The placement procedure cost can be reduced in many patients by doing port placement at time of surgery for the primary disease or doing it under local anaesthesia. The procedure can safely be performed as a day care surgery. This cost is still out of reach of many patients who are being treated at charity institutions and under government sponsored programs which do not allow for a port. This cost is equivalent to almost 2-3 cycles of chemotherapy and explaining the poor patient is a difficult task even for the convinced surgeon. In the long run port cost is very much acceptable considering the long-term utility and convenience against the peripheral line related complications. Many support organisations are keenly helping patients in need for port, especially patients who have bilateral disease, obese, have history of vein thrombosis or drug extravasation injuries etc.

Limitations

Being a retrospective study, the aspect of pre-operative patient communication is absent, which if properly done would probably lead to increase in port placements and use. Also, the patients who had port placement done in institutes outside the region but receiving chemotherapy here were not included to ascertain their satisfaction and comfort. Patients in the same region who are easily affording the port cost are not separately evaluated to

remove the economic bias. Most importantly, there is no direct comparison with patients having no chemo ports. A prospective randomised study would be better suited to answer these questions.

CONCLUSION

We recommend following points to promote the use of chemotherapy ports for proper indications so as to make chemotherapy a lesser painful experience for the patients.

Inclusion of port placement and handling in undergraduate and postgraduate medical curriculum, as like peripheral venous cannulation or insertion of a central line. Active effort by treating surgeons and physicians to understand the benefit of port so as to promote their use. Short courses for existing nursing staff for training for proper handling of the chemo port and formation of trained teams in hospitals for port management. Inclusion of the chemotherapy port' in government sponsored health programs and charity institutions profile. Establishment of standard operating protocols for chemo port placement technique, and cannulating and decannulating the port needle.

A prospective randomised study in this region to compare patient satisfaction and quality of life with or without port in similar socioeconomic situations will be the proper way to establish the benefit of the port. Until then a convinced and trained surgeon with help of social support organisations, can persuade the needy patient for port placement without fear of major short- and long-term morbidity and provide her a definite improvement in quality of life.

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