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Original Research Paper

Oncology

EXPERIENCE OF CHEMO PORTS FOR CANCER CHEMOTHERAPY FROM A TERTIARY CANCER CENTRE OF SOUTHERN INDIA

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ABSTRACT

Introduction: Chemo port is an indispensable part of the management of patients with cancer and delivers long-term venous access. There are few studies from resource poor countries reporting complications of chemo port.

Aims: This study was aimed at unfolding the complications of chemo port in patients with cancer.

Materials and Methods: This retrospective observational study analysed 58 patients who underwent chemo port insertion. The medical records of these patients were studied for the patient characteristics, diagnosis, port-related complications and their management.

Results: A total of 58 ports were implanted and 2 ports were removed due to port-related complications. There were 11 males and 47 females whose ages ranged from 2 years to 68 years (median age 39.5 years). Of 58 ports, there were 8 complications that led to the removal of 2 ports. Port-related infection was the most common complication observed in our study (8.6% of which 3.4% were major complications leading to removal of port and 5.2% had minor wound complications). Malposition of catheter, Catheter fracture and migration and bleeding during chemo port removal were encountered in 5.1% of patients.

Conclusions: In conclusion, chemo port is a bonus for majority of the patients because of the ease of treatment it makes physical activity of patient's life more convenient, it still has got complications. Early identification of these complications helps in avoiding major devastating injury. Nevertheless, knowing the appropriate and accurate use and not overlooking potential complications, an intravenous port system is a comfortable and safe device.

KEYWORDS :

INTRODUCTION

Many cancers have turned out to be highly treatable with the obtainability of aggressive chemotherapy regimens and improved supportive care. Continued access to venous system can be accomplished with a peripherally inserted central venous catheter, an externalized tunnelled catheter or an implantable venous access device. Long-term central venous access devices are indispensable in managing oncology patients, as they minimise the embarrassment of frequent venepuncture and cannulation.

There are four main classifications of central venous catheters. (1) They include Non-tunnelled catheters, Tunnelled central catheters, Fully implantable or surgically implantable catheters and peripherally inserted central venous catheter. Implantable venous access device is also known as indwelling central venous access devices, totally implantable central venous access devices, port-A-Cath, port or chemo port. Insertion of chemo port requires anaesthesia, in the form of local or general. The advantages provided the by chemo port are less risk of catheter-related sepsis, less prerequisite of care, less meddling with activities of the patient. (2)

The main sites for central venous access devices are the internal jugular, external jugular and sub-clavian veins. There are complications that are associated with the usage of chemo ports. Immediate complications occur at the time of the procedure, and usually consist of injury to the surrounding vital structures or mispositioning of the catheter tip. The most frequent immediate complications include cardiac arrhythmia, accidental arterial puncture, haemothorax, pneumothorax, and air embolism (rare). (3)

The most common port related complications include catheter occlusion, vein thrombosis, port pocket infection, catheter related sepsis, device rotation or dislodgement, catheter migration, skin necrosis, pocket hematoma and extrusion of the port.

The rare complications associated with the port are pinch off syndrome, cardiac tamponade, difficulty in removal and bleeding during removal. The most distressing complications that can lead to chemo port removal and need to be addressed are central venous catheter related infection and thrombosis.

This study was done to retrospectively review the cases in the authors' institution along with comparison and review of the studies done in past.

MATERIALS AND METHODS

Case records of 58 patients getting treated for various solid and haematological malignancies who underwent totally implantable central venous access device insertion (chemo port) were included for retrospective analysis. The period taken was from January 2016 through February 2012. All patients underwent complete blood count and prothrombin time and activated partial thromboplastin time (to rule out bleeding tendency) since all of them were receiving chemotherapy. Chemo port insertion is usually done before administering first cycle of chemotherapy and chest radiograph to rule out chest infections related to immune suppression or chest masses. The procedure was explained in detail to the patients and the alternatives were given and the patients gave consent, preferring chemo port insertion over repeated peripheral vein access.

All the patients underwent insertion of chemo port under anaesthesia. One dose of intravenous antibiotic is injected 30 min before starting the operation. This technique is done under anaesthesia in supine position. The port system used was titanium port and silicone catheter (usually 8 French) (Fig. 1). A roll is placed under the shoulder of the patient. Then

preparation and draping are done from the ear to the xiphoid region on both sides of the patient. The device, which consists of a chamber (completely metallic, plastic or both) connected to a catheter, is placed under the skin. The catheter is threaded into the sub-clavian, jugular or femoral vein by means of closed method of accessing the vein without fluoroscopy guidance. The catheter is tailored to reach the right atrium or superior vena cava (SVC) and attached to the port. (Fig 2) The desired location of the catheter tip is at the junction between the right atrium and SVC. The subcutaneous reservoir is placed in a pocket created in front of the pectoralis major muscle, in the sub-clavicular region. (Fig 3) The whole procedure takes about 30 to 40 min. Catheter tip position should be verified radiologically with a post-operative chest X-ray. After the procedure, patients were observed for changes in temperature, pulse, blood pressure and respiratory rate for 4 hours.

During access to the port strict aseptic precautions are taken to prevent central line associated blood stream infections (CLABSI). The site is cleaned with 2 % chlorhexidine gluconate before accessing. To maintain patency of subcutaneous ports, a four weekly flush was used as recommended by European society of medical oncology clinical guidelines for central venous access in oncology. (4)

Figure 1 chemo port

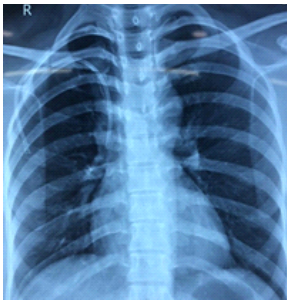

Figure 2 x ray showing normal position of chemo port

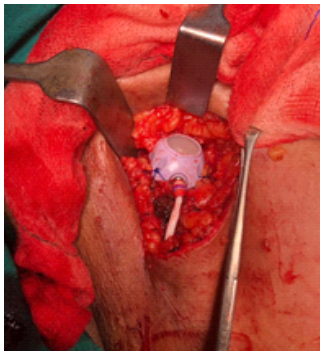

Figure 3 chemo port reservoir place in subcutaneous position over pectoralis major muscle

RESULTS

A total of 58 cases were included in this study. There were eleven males and 47 females, all of them were being treated for solid and haematological malignancies. The distribution of the malignancy in which chemo port was indicated are list in table 1. The age of the children ranged from 2 years to 68 years. The median age group is 39.5 years. The follow up period ranged from 6 to 23 months with mean follow up of 9 months. The most common site of insertion of chemo port was through right subclavian vein in 96.8%, followed by internal jugular in 3.2%. None of the patients were catheterised by femoral approach.

Table 1– cancer distribution for cancers	
Breast cancer	38
leukemia	8
Soft tissue sarcoma	3
Gastric carcinoma	1
Lymphoma	4
Ewings sarcoma	3
Ceacal carcinoma	1
Total	58

Two patients developed catheter related sepsis. The first patient was a child who had chemo port insertion done for treating ALL, developed high grade fever with rigors after few days of catheterisation. The flow was good in the catheter, with occasional difficulty in flushing of catheter. Though primarily a conservative line of management was implemented, the port was later removed for fear of impending sepsis in the neutropenic condition. For the second case, patient developed fever, purulence at the insertion site, chills and signs of sepsis of sudden onset, after catheter being used for 3 cycles of chemotherapy for breast cancer. She is a known diabetic controlled by hypoglycaemic drugs. paired blood samples should be obtained (acquiring the same volume of blood) from the catheter and from a peripheral vein were taken. Chemo port was removed for this patient because of the continued infection despite 48–72 h of adequate coverage of antibiotics. One patient had infection related wound dehiscence and exposure of reservoir as shown in figure 4.

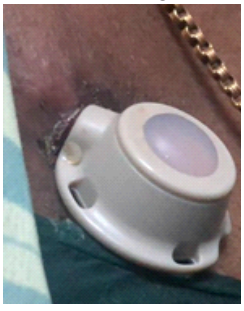

Figure 4 reservoir exposed following infection

One patient has mispositioning of the catheter tip and the catheter proximal part has been coiled in the right atrium as depicted in the figure 5. The patient did not have any complications related to that and was identified in chest x-ray. Catheter repositioning was done.

Figure 5 chest x ray showing mal position of catheter tip

For a patient who underwent chemotherapy through chemo port, after 1-year of routine follow-up a chest x-ray revealed the chemo port catheter to be fractured at the site of insertion in subclavian vein as shown in figure 6 and she was

asymptomatic at that time. The patient was transferred to the catheterization laboratory, and the fragmented catheter through Right femoral vein approach and snared using 7F JR guide and 15mm snare under fluoroscopy without complications. The proximal percutaneous portion of the catheter was removed through an infraclavicular incision and follow up chest X-ray revealed no left out fragments.

Figure 6 catheter fracture and migration

One patient had bleeding during removal of the chemo port. During removal of chemo port, bleeding was encountered from non-visualised source. She was immediately transferred to cardiovascular surgery department. A venogram was performed revealing chemo port in one of the tributaries of subclavian vein and tear in the anterior wall of subclavian vein. Tear was repaired with clips and removal of the chemo port was done ligating the tributary.

Three patients developed minor wound infections (two early and one late) in the chest wound which could be managed conservatively. There were no instances of pneumothorax, bleeding and mediastinal hematoma.

DISCUSSION

For the past few decades, for patients who need multiple or protracted intravenous therapy or multiple blood sampling, insertion of central venous catheter has been offered. By implantation of this device the peripheral veins of the patients are protected, and patients do not suffer from frequent painful needle insets that are needed for injection of drugs or repeated sampling of blood. This device is inserted in a central vein and hence long-term efficacy is improved. Because of the wide surface of the port, it can be accessed with ease both for drawing blood samples and infusion of fluids and drugs. Because of insertion into the central vein, injection of hypertonic solutions or drugs that are used for chemotherapy were made easy.

Chemo port is an implantable device which is usually inserted into Right subclavian vein owing to its straight course and easy approachability. Right internal jugular vein (RIJV) is often carefully chosen as an ideal vein for central venous access for chemo port access because of its straight course, reduced risk of malposition, and thrombosis. The injection port reservoir is located subcutaneously and is connected to the actual port catheter which reaches intravenously into the vena cava superior just above the atrium of the right heart. (5)

Generally, chemo port placement is well tolerated in majority of patients; however, there are complications which are accompanying chemo port – immediate post-operative or late in the long term. Aparna et al., (6) study in children showed 11.9% chemo ports was complicated by port site infection and mechanical complications, venous thrombosis and skin necrosis in 4.3%, 0.4%, 0.4% respectively. The most frequent complication associated with chemo port in adults was port related infection (1.47 %). Further complications were skin necrosis (0.21%); incision dehiscence (0.21%); broken or torn catheter (0.42%); jugular vein thrombosis (0.21%); thrombosis of superior caval vein (0.21%). (7)

Catheter fracture and embolization is an extremely uncommon complication with an estimated incidence reported to range from 1.1% to 2.1%. (8) Kavitha Srivatsa et al., study demonstrated the incidence of catheter fracture is 2.3%. (6) This is similar to the results of our study showing the rate of this complication is 1.72%. The typical site of catheter rupture is in the space between the first rib and the clavicle. This is the site where the catheter inside the subclavian vein gets compressed between the clavicle and the first rib. This was first described by Aitken and Minton as the "pinch-off sign". (9) The most common clinical sign seen with this condition is difficulty in flushing the chemo port. Probable explanation for the mechanism of difficulty in flushing is the mechanical obstruction of the catheter developed due to repeated compression as a result of catheter "pinch off syndrome". The repeated compression leads to diminishing catheter patency, fracture and subsequent embolization. Alexey Surov et al., (10) study proposed that most embolized catheter remains were in the pulmonary arteries (35%), followed by right atrium (27.6%), right ventricle (22%), and superior vena cava or peripheral veins (15.4%).

It is currently suggested that the tip of Central venous catheter is positioned at the level of mid-lower SVC to Cavo atrial junction. (11) Malposition of a Central venous catheter is the situation in which catheter lies outside of SVC, whose tip not located in the ideal position. Misplaced catheters have been described in virtually every possible anatomical location. There are two types of malposition based of the location of the catheter such as intra-cava malposition and extra-cava malposition. (12) Catheter malposition is generally allied with grave penalties while some of them remain unrecognized resulting in improper diagnosis and delayed treatment. Recent procedural advances, amplified availability of imaging, guidewire manipulation, and understanding in the management of complications have an enormous impact on morbidity and mortality in the management of malposition. Procedural imprecision, structural variation, and inter-operator capriciousness are inclined to catheter misplacement. (13,14) Reasons such as branches of the vein, vein tortuosity, critical angulations of vessels, congenital anatomical variation, and vein stenosis possibly will consequence into misplacement. (15)

Infection remains the most common complication in cancer patients with indwelling Central venous catheter. (16) Line-related infections are a common and possibly stern complication. (17) The most commonly isolated organisms are Staphylococcus aureus and Staphylococcus epidermidis. (18) Infections that transpire within 10 days of line insertion are often due to skin flora and, subsequently, by intraluminal colonization. (19,20,21) The incidence of infection is higher with temporary catheters and the infection rate increases more rapidly over time with their use. (22) the indications for catheter removal are indicated at the diagnosis of severe sepsis, suppurative (septic) thrombophlebitis, endocarditis, tunnel infection, port abscess, blood stream infection which continues despite 48–72 h of adequate coverage. (4) The infection rate in our study is 3.4%, comparable to other studies. (6)

The major important factor to be dealt through chemo port removal is, the minute there is resistance during the pull of chemo port tubing, there continually exists a chance that chemo port tubing may get fractured and because of the negative intrathoracic pressure, the distal end may get embolised. Kenji Nishinari et al., (23) study suggested that catheter retention does occur due to formation of the fibro cellular sheath on the external wall of tubing which is composed of fibrin and smooth muscle cells proliferation and areas of thrombi at different stages of organisation, collagen and endothelial cells, that lead the encapsulating sheath strongly adherent to the catheter and wall of vein. They suggested that chemo port catheter be fractured and ligate the stump close to the entry of vein, in the event of resistance to the removal of the catheter. Hong et al., (24) was the first to describe the breakthrough technique to remove the stuck

catheter. This procedure was performed under general anaesthesia in an operating room setting with balloons inserted and dilated sequentially in each lumen of the stuck catheter after the catheter hub had been removed.

Our study has its limitations, as it is a retrospective series based on case records. Another major drawback of this investigation is the limited detail available for each case.

The strength of the study is that it clarified the safety and efficacy of chemo port usage in a developing country. This demands the need for more frequent use of chemo ports even in resource poor countries because of its cost effectiveness and very few complications. With qualified nursing staff devoted for the care of the chemo port, complications are negligible and can be managed effortlessly.

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