Nigerian Journal of Chest Diseases (NJCD)
Vol. 5, Issue 1
Page 21-26

Case Report

Early experience with Chemoport Insertion and Management for Chemotherapy in a Tertiary Hospital, South-South, Nigeria-the COVID-19 Factor.

Ogbudu SO[1,2], Eze JN[1], Nwagboso CI[1], Dien EO[1] Etiuma AU,[1,2] Bassey OO,[1] Udosen JE,[2] Ogbudu HE.[2]

[1]Division of Cardiothoracic/Vascular Surgery, Department of surgery, University of Calabar Teaching Hospital. Calabar-CRS. [2]Department of Surgery, College of Medical Sciences, University of Calabar, Calabar, Nigeria

Abstract

Background: Chemoport has been seen as a useful device for long term venous access for infusion of chemotherapeutic drugs and other agents. There are few studies from resource poor countries reporting complications of chemoport. The aim of this early study is to evaluate the feasibility of chemoport insertion without image guidance, by closed technique without direct visualization of a major vein mainly internal jugular vein and to study the complications associated with the procedure. This is a prospective observational study which analysed four patients who underwent chemoport insertion. **Objective:** Report of our early experience with the insertion of Chemoport for chemotherapy in a tertiary referral hospital in South-South, Nigeria-and the effect of COVID-19 on this procedure. To also create awareness that routine placement of chemoport can be done in the Division of Cardiothoracic and vascular Surgery for chemotherapy and the administration of other agents. **Methods:** The medical records of these patients were analysed for the patient characteristics, diagnosis, port related complications and their management. **Result:** Four patients with metastatic malignancy requiring chemotherapy or targeted therapy or both were included in this study. There were 3 female (75%) and one male (25%). Breast carcinoma account for 75% and occurred in the female and large bowel carcinoma account for 25% which occurred in the male. All patients underwent chemo port insertion under 1% local anaesthesia in the theatre under 1g of intravenous ceftriaxone as prophylaxis and post procedure the patients were started on oral cefixime 200mg daily for five days and an initial intramuscular pentazocine 30mg is started and change to oral diclofenac 50mg twelve hours for 3days but could be extended to 5days in those with low pain threshold except it is contraindicated. Visual analogue pain scale was zero immediately after the procedure and range from 4-6 two hours post procedure. The oral diclofenac was extended to five days in one patient. The ECOG was 0-2 in the four patients. None of the patients had any major intraoperative complications. Post operatively one patient was found to have a partial obstruction of chemo port catheter, later fracture and distal migration (25%) at the third course of chemotherapy. Catheter retrieval was planned but patient ECOG had dropped to 3 and considered a high risk for catheter retrieval. Patient was started on vasoprim 75mg daily to prevent catheter thrombosis. No surgical site infection was noted in this study. High complication rate is observed in this study because of the patient size and our early learning curve. Complication rate may be further reduced by using well designed procedure, Doppler duplex ultrasound guided puncture and fluoroscopy with contrast media. Job loss from COVID-19 pandemic, increasing poverty and the fall in naira-dollar exchange are other additional factors affecting affordability of Chemoport and image guided procedure making blind percutaneous insertion the only option. **Conclusion:** Chemoport insertion make administration of chemotherapy less traumatic and less of thrombophlebitis but not without complications.

Keywords: Chemoport. IJV. Image Guidance, COVID-19

Correspondence.

Stephen Omirigbe Ogbudu.

Department of Surgery, College of Medicine, University of Calabar, Cross River State, Nigeria/Division of Cardiothoracic Surgery, Department of Surgery, University of Calabar Teaching Hospital, Calabar, Cross River State, PMB 1276, Calabar 54271, Nigeria. Postal code: 540271, Tel: +234-803-724 4560; e-mail: ogbudustepheno@unical.edu.ng

Introduction

The use of totally implantable central venous port system (TICVPS) was first reported in early 20th century. The TICVPS may reduce infection rates, pain, thrombophlebitis and thrombosis from repeated venepuncture in patients with malignancy for chemotherapy[1].It saves the patient of recurrent venepunctures as the implantable subcutaneous chamber directly connects to the central veins through a catheter[1, 2]. The whole system remains in the subcutaneous tissue underneath the skin which add assent on the part of the patient. It is usually placed by a cardiothoracic or a vascular surgeon but can be placed by an interventional radiologist under image guidance. Reported complications are complications arising directly or indirectly from the procedures, including arterial/cardiac punctures, nerve injury, bleeding, haematoma, pneumothorax, haemothorax and long-term complication, including infection, thrombosis, catheter fracture, migration and embolization[1,2]. As the insertion technique and management of TICVPS improved, the associated complications reduced, however, when complications occur the length of hospital stay and cost of treatment increased[3,4]. It is therefore necessary to reduce these complications intraoperative, intra intervention and post TICVPS insertion.[1]

Patients and Methods

The medical records of these patients were analysed for the patient characteristics, diagnosis, port related complications and their management at the Division of Cardiothoracic and Vascular Surgery, Department of Surgery, University of Calabar, Calabar, Nigeria form 1st Jan.2020-Dec.2022. All patients had stage IV metastatic disease requiring either Chemotherapy or targeted therapy or both. Three patients had breast carcinoma and one had colorectal carcinoma.

All patients clinically evaluated for any neck swelling, cervical lymphadenopathy or goitre any chest wall scars and any significant comorbidities. Preoperative investigations for all patients include Full Blood Count, Clotting profile, Bleeding time, serology for HIV, HCV and HbsAg, CXR(PA) and other investigations as required considering any comorbidities. Chemoport insertion was planned and done under local anaesthesia. The procedure was planned as elective procedure. Asepsis was maintained throughout the course of the procedure. Skin preparation was done using Savlon and 10% povidone. Draping done to isolate the neck, lower part of right mandible, right shoulder and the chest up to the sternal angle of Louis as shown in the Fig 1.

One-percent (1%) Lidocaine was used as a local anaesthetic for infiltration. Approximately 10-20mls of this solution was infiltrated between the two heads of right sternocleidomastoid muscles, along a tract 5-10cm from the sternoclavicular junction to the proposed site of port's access device.

After checking for local analgesia with a hypodermal needle or a toothed tissue forceps. The face of the patient is turned to the contralateral side. A 24-gauge needle is attached to a 5mls syringe and inserted in between the two heads of right sternocleidomastoid advance downward and posterior in a straight direction to the right sternoclavicular junction with repeated aspiration while advancing the needle, the needle is kept insitu after aspirating venous blood, the presterilized chemoport needle is introduce using the 24-gauge needle as a guide after aspiration of venous blood the needle is stabilised, this is replaced with a presterilized size 16 needle and a J-shaped tip guide wire is introduced 35-40cm mark while watching for arrhythmias. A dilator is passed over the guide wire and a small nick is made with a size eleven blade beside the guide wire to allow the dilator advance into the vein a short distance and removed. The catheter introducer is introduced over the guide wire to the calculated length and guide wire removed. The chemoport catheter is introduce to the calculated length while de-sheathing the catheter introducer and the catheter is tunnel and anchored to the chemoport which is further anchored to the fascia over pectoral major muscle and the skin is close with nylon 3/0. The port is test by aspiration connected to a Huber needle.

Results

Four patients with metastatic malignancy requiring chemotherapy or targeted therapy or both were included in this study. There were 3 female (75%) and one male (25%). Breast carcinoma account for 75% and occurred in the female and large bowel carcinoma account for 25% which occurred in the male. All patients underwent chemo port insertion under 1% local anaesthesia in the theatre under 1g of intravenous ceftriaxone as prophylaxis and post procedure the patients were started on oral ceftriaxone 200mg daily for five days and an initial intramuscular pentazocine 30mg start and change to oral diclofenac 50mg twelve hours for 3days but could be extended to 5days in those with low pain threshold. Visual analogue pain scale was zero immediately after the procedure and range from 4-6 two hours post procedure. The oral diclofenac was extended to five days in one patient. The ECOG was 0-2 in three patient and 3 in one patient. None of the patients had any major

Table 1. Distribution of Complications

Sex /F	Pneumothorax	Bleeding/haematoma	Malposition	CA BSI	Pocket infection	Migration	Skin erosion	Malfunction	DVT	Hyperpigmented skin,hypertrophic scar/Keloid
F/56	Nil	Nil	Yes	Nil	Nil	Yes	Nil	Yes	Nil	Nil
F/68	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
M/57	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
F/38	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Yes (hyperpigmented port site skin)

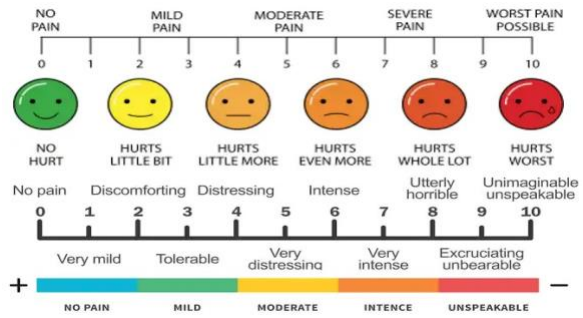

Fig. 1. Numeric Pain Score

Table 2. Demographics and Clinical Characteristics

Variables	values
Sex	
Male	1(25%)
Female	3(75%)
Mean Age	(49.7%)
Anaesthesia	
Local	4(100%)
General	0(0%)
Port implantation site	
RIJV	4(100%)
LIJV	0(0%)
Catheter angles 70.5±20(50.5±90.5)	
Underlying disease	
Breast Carcinoma	3(75%)
Colorectal Carcinoma	1(25%)
Others	0(0%)
Comorbid conditions	1{25%) diabetes

Score	Patient Status
0	Fully active, able to carry on all pre-disease performance without restriction
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work
2	Ambulatory and capable of all self-care but unable to carry out any work activities; up and about more than 50% or waking hours
3	Capable of only limited self-care; confined to bed or chair more than 50% of waking hours
4	Completely disabled; cannot carry on any self-care; totally confined to bed or chair

Fig. 3. ECOG Scoring System

intraoperative complications. Post operatively one patient was found to have a partial obstruction of catheter, later fracture and distal migration (25%). Catheter retrieval was planned but patient was unfit for any further procedure. Patient was on vasoprim 75mg daily to prevent catheter thrombosis. No surgical site infection was noted in this study. High complication rate is observed in this study because of the patient size. Complication rate may be further reduced by using well designed procedure, Doppler duplex ultrasound guided puncture and fluoroscopy with contrast media.

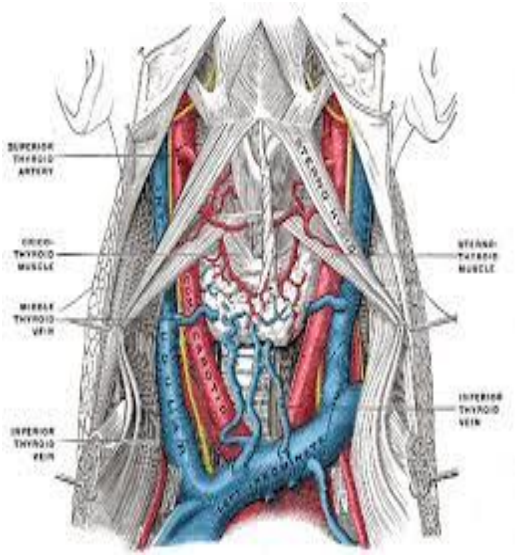

Fig 4 Internal Jugular Vein

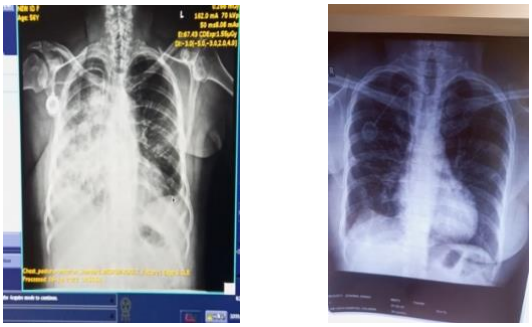

Fig. 5. Chest X-ray Showing the Chemoport

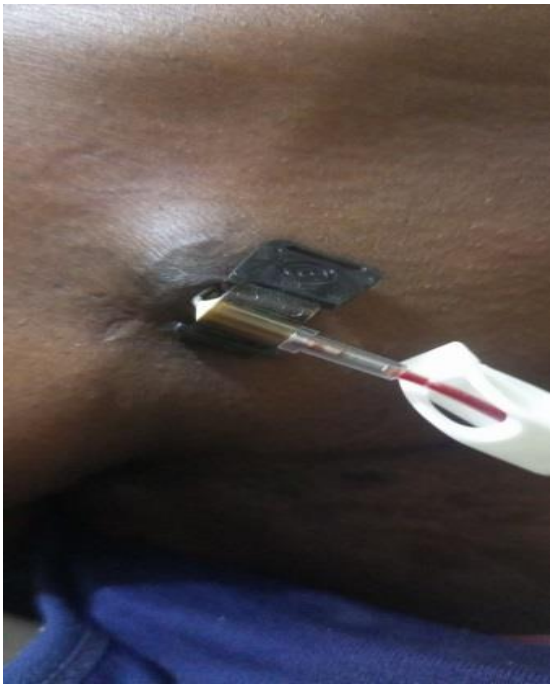

FIG-6 Hyperpigmented skin over the chemoport

Table 3. Comparison of the frequency of complications (%) between different studies

Complications	Mc Gee & Gould review	Teichgraber et al n-3160	Babu et al n-180	Kim et al n-827	Shah et al n-**263**	Present study n-4
Pneumothorax	0.2	0	3.7	0		0
Bleeding/haematoma	0.2	0.2	7.4	0.2	0	0
Mal position	0	0	5.6	0.1	1.5	1
DVT	4.3	0.5	4.6	0.4	1.5	0
CABSI	13.6	5.1	18.8	0.8	0.7	0
Pocket infection	0	0.3	0	0.6	1.14	0
Migration	0	0.6	10	1	0	1
Skin erosion	9.3	0.2	0	0.7	0	0
Malfunction	4.6	0.1	0	0.01	0	1

Discussion

Currently venous device systems are widely used in malignancy patients to facilitate cyclical infusion of chemotherapy[5] The use of totally implantable venous access devices started over three decade ago[1], subsequently, different techniques were established to reduce complications, safe implantation and comfort of the patients[6] Biffi et al reported the equivalence of the three most used implantation techniques ,that is percutaneous(Seldinger) perforation of the internal jugular vein (Fig 4), "blind technique" through anatomical landmarks as in this study, ultrasound guided access to the subclavian vein and open surgical access to the cephalic vein[7]. In this study chemoport devices were implanted by Seldinger technique puncture of the right internal jugular vein using anatomical landmarks[1].The right internal jugular vein is selected as a primary access vein for chemoport because of its straight course, reduced risk of malposition, stasis, kinking and eventually thrombosis. The RIJV provides direct access to the superior vena cave[8]. The LIJV is considered as a secondary venous access vein in patient with locally advanced right breast cancer, skin infiltrations or due to mastectomy or adjuvant radiotherapy[1,9]

In general, chemoport placement is well tolerated in almost all patients, however there are some complications associated with chemoport implantation. There are divided into the immediate, immediate post implantation and late in the long term. In this study the overall complication rate was 25% with no mortality recorded in the four patients. Shah T et al recorded complication rate of 5.32% from 263 cases without mortality associated with the procedure and management[1] in terms of the complication rate, the complication rate in this study is 25% as against 5 to 19% in other studies[1, 10]. Interventional radiologist perform image guided percutaneous insertion (Seldinger technique) or using ultrasound guided technique at the access site and fluoroscopy to check the catheter placement with good success rates comparable to those of the surgeons[1,2]. No significant difference in the rate of infection between the angiographic suite and the operation theatre were reported with P <0.743. When interventional radiologists perform TICVPS, the infection rate was relatively high >5%[4].

A comparison of complications reported in various studies is summarised in table 3[1,10,11,12,13]. Complications at the chamber insertion site include infection, sensation of a foreign body, skin erosion, hyperpigmented skin changes and keloid or hypertrophic scar. Infection of the chamber insertion site comprised of erythema, tenderness and discharge[12,14] in this present study only one patient developed initial resistance to flow and effort to get the infusion to flow may have accounted for the fracture and later migration. Plan was made for removal but patient was started on antiplatelet agent to prevent catheter thrombosis as the patient ECOG dropped from a score of 2 to a score of 3 from the primary disease. None of our patient had catheter-associated blood stream infection (CABSI). Shah T et al reported CABSI rate of 0.7% and previous studies reported an overall incidence rate of 0 to 6.8%[16].

To reduce infection associated complications, TICVPS insertion was performed in theatre under aseptic conditions. Skin erosion at the chamber insertion site is a rare complication. The skin overlying the port chamber break down, exposing the chemoport in the subcutaneous tissue. It is a gradual process, from chamber tension on the skin or from loss of subcutaneous fat or pressure on the subcutaneous fat from a tight chamber. This usually results in infection and may manifest with local or systemic symptoms and signs such as pain, discharge or abscess, fever with chills and rigors. However, erosion without infection has been documented[17] Repeated abrasion or needle puncture are others ways of causing skin erosion. Nakamura T et al in 2017 reported incidence of skin erosion to be 1%[18]. Skin erosion is not reported in this study. However, one of our patients with diabetes mellitus reported to be having a feeling of a foreign body from the chamber as he was gradually losing subcutaneous fat and requested for the removal of the chemoport. To prevent the complication of skin erosion adequate subcutaneous chamber is advocated not too loose and not too tight, absolute haemostasis is important and skin should be close with a monofilament suture and should not be under tension[1]. In addition, adequate nutrition is essential but in obese patient's weight loss is advocated.

Catheter fracture and embolization are rare complications with a reported incidence ranging from 1.1% to 2.1%[1,19]. Aprana et al reported an incidence of catheter fracture to be 2.3%[1]. The usual site of catheter fracture is the space between the first rib and the clavicle.

This is the point where the catheter inside the subclavian vein gets compressed. This was first described by Aitken et al as the "pinch-off sign"[20]. The commonest clinical sign seen in this condition is difficulty in infusion into the chemoport. The explanation is the mechanical obstruction of the catheter developed due to repeated compression as a result of catheter pinch-off syndrome[1].

The repeated compression leads to decreasing catheter patency, fracture and embolization. Alexey S et al[21] proposed that most embolised catheters were in the pulmonary arteries 35%, followed by the right Atrium 27.6%, right ventricle 22% and SVC or peripheral veins 15.4%. This complication occurred in one of our patients (25%). However, we used RIJV and so the mechanism of obstruction is different. It is most likely a mechanical compression of the catheter as the catheter enters the RIJV or at the sternoclavicular junction and attempt to infuse fluid into the catheter caused the separation of the catheter from the chemoport or thrombosed at the angle the catheter makes with the sternoclavicular junction causing resistance to flow, eventual fracture and embolization. In this study the fracture catheter was in the RA.

Malposition of the TICVPS catheter is the situation in which the catheter lies outside the SVC and whose tip is not located in the ideal position. There are two main types of malposition's; intra-cava and extra-cava malpositions[22]. The intracaval misplacement includes the placement of the port catheter into the carotid artery, azygos vein, internal thoracic vein or vertebral vein[23]. Chest X-ray often identifies the intracaval misplacement of the port catheter easily. It is often managed successfully by the immediate removal of the port under image guidance.

The less common type of port misplacement is the misplacement of the port catheter into the extra cava space, which includes the epidural space, the pericardium, the pleural space the thoracic duct and the mediastinum[23]

Hyperpigmented skin was noticed in one of our patients during the follow up as showed in Fig-6. The mechanism could result from tight chemoport pocket causing the stimulation of melanocytes to increase melanin synthesis or accidental extravasation of chemo agents or fluid into the subcutaneous tissue causing inflammation and stimulation of melanin production resulting in hyperpigmentation of skin around the port.

Although, keloid and hypertrophic scars have not been reported but are likely complications that can result either from the primary procedure of port placement or repeated puncture of the skin with Huber needle especially in keloid formers.

Conclusion

In conclusion, totally implantable central venous port systems have gained a significant role in the treatment of many patients who require long-term intravenous therapy. Radiologic assessment is fundamental both to diagnosis and in planning interventional procedures for retrieval of fractured and embolised catheter fragments.

Reference

1. Shah T, Vijay DG, Shah N, Patel B, Patel S, Khant N, Gothwal K. Chemoport Insertion-Less is More. Indian Journal of Surgical Oncology 2021;12(1):139-145
2. Yaacob Y, Nguyen DV, Mohamed Z, Ralib AR, Zakaria R, Muda S. Image-guided chemotherapy insertion by interventional radiologist: a single-centre experience on periprocedural complications. Indian J Radiol Imaging 2013; 23:121-125
3. Kim HJ, Yun J, Kim HJ, Kim KH, Kim SH, Lee SC, Bae SB, Kim CK, Lee NS, Lee KT, Park SK, Won JH, Hong DS. Safety and effectiveness of central venous catheterization in patients with cancer: prospective observational study. J Korean Med Sci 2010;25: 1748-1753
4. Kumar AH, Srinivasan NM, Thakkar JM, Mathew S.A prospective observational study of the outcome of central venous catheterization in 100 patients. Anesth Essays Res. 2013; 7:71-75
5. Vescia S, Baumgartner AK, Jacobs VR, Kiechle-Bahat M, Rody A, Loibl S, Harbeck N. Management of venous portal system in oncology: a review of current evidence. Ann Oncol 2008: 9-15
6. Teichgraber UK, Streitparth F, Cho CH, Benter T, Gebauer B. A comparison of clinical outcomes with regular and low profile totally implanted central venous port system. Cardiovasc Intervent Radiol 2009; 32:975-979
7. Biffi R, Orsi F, Pozzi S, Pace U, Bonomo G, Monfardini L, Della Vigna P, Rotmensz N, Radice D, Zampino MG, Fazio N, de Braud F, Andreoni B, Goldhirsch A. Best choice of central venous insertion site for the prevention of catheter related complications in adult patients who need cancer therapy: a randomized trial. Ann Oncol 2009; 20:935-940
8. Di Carlo I, Cordio S, La Greca G, Privitera G, Russello D, Puleo S, Latteri F. Totally implantable venous access devices implantable surgically: a retrospective study on early and late complications. Arch Surg. 2001; 136:1050-1053
9. Araujo C, Silva JP, Antunes P, Fernandes JM, Dias C, Pereira H, Dias T, Fougo JL, A comparative study between two central veins for the introduction of totally implantable venous access devices in 1201 cancer patients. Eur J Surg Oncol 2008; 34:222-226
10. Teichgraber UK, Kausche S, Nagel SN, Gebauer B. Outcome analysis in 3160 implantations of radiologically guided placement of totally implantable central venous port system. Eur Radiol 2011; 21:1224-1232
11. Babu KG, Suresh -Babu MC Lokanatha D, Bhat GR. Outcomes, cost comparison and patients' satisfaction during long term central venous access in Cancer patients: experience from a tertiary care cancer institute in south India. Indian J Med Paediatr Oncol 2016; 37:232-238
12. McGee DC Gould MK. Preventing complications of central venous catheterization. N Engl J Med 2003; 348:1123-1133
13. Kim DH, Ryu DY, Jung HJ, Lee SS. Evaluation of complications of totally implantable central venous port system insertion. Exp Ther Med 2019;17: 2013-2018
14. Bishop L, Doughtery L, Bodenham A, Mansi J, Crowe P, Kibbler C, Shannon M, Treleaven J. Guidance on the insertion and management of central venous devices in adults. Int J Lab Hematol 2007; 29:261-278
15. SafdarN, Maki DG. Risk of catheter related bloodstream infection with peripherally inserted central venous catheters used in hospitalised patients. Chest 2005;128: 489-495

16. Almhanna K, Pelley RJ, Thomas Budd G, Davidson J, Moore HC. Subcutaneous implantable venous access device erosion through the skin in patients treated with anti-vascular endothelial growth factor therapy: a case series. Anti-Cancer drugs 2008; 19:217-219
17. Lee AY. Cancer and thromboembolic disease: pathogenic mechanisms. Cancer Treat Rev 2002; 28:137-140
18. Nakamura T, Sasaki J, Asari Y, Sato T, Torii S, Watanabe M. Complications after implantation of subcutaneous central venous port (PowerPort®). Ann Med Surg 2017; 17:1-6
19. Buba N. Complications of chemoport in children with cancer: experience of 54,100 catheter days from a tertiary cancer center of Southern India. South Asia J Cancer 2015; 4:143-145
20. Alexey Surov A, Stoevesandt D, Behrmann C, Wienke A. Intravascular embolization of venous catheter-causes, clinical signs, and management: a systemic review.2009;33:677-685
21. Gibson F, Bodenham A.2013.Misplaced central venous catheter applied anatomy and practical management. Br J Anaesth 2013; 110:333-346
22. Verso M, Agnelli G. Venous thromboembolism associated with long term use of central venous catheters in cancer patients. J Clin Oncol 2003;213665-3675
23. Budis S, Calick D, Parrish D. misplacement of internal jugular chemoport into the epidural space. ACS case review 2023:1-10