PERIPROCEDURAL COMPLICATIONS OF IMAGE GUIDED VENOUS ACCESS PORT IMPLANTATION IN UKMMC

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Abstract

Objective: This study was conducted to highlight the periprocedural complications of image guided implantable venous access ports in EIR-UKMMC. **Methodology:** This was a cross-sectional, retrospective, descriptive study started from January 2008 until June 2010. All files of the patients with port catheter implantation in UKMMC were reviewed for periprocedural complications within 14 days. The implantation were performed under image guidance by Radiologist or by Senior Radiology Trainee in Angiography suite and in OT of Emergency Department. The data were attained by using medical records from UKMMC, IRIS, PACS, data from Angiography suite and Emergency Department OT and analyzed with SPSS software. **Results:** A total of 161 catheters were inserted in a period of 18 months. The implantations were successfully implanted in 160 patients (99.4%). Only 1 placement was unsuccessful where the patient had extensive venous thrombosis. Total periprocedural complication was seen in 22 patient (13.7%). Malposition was found in 2 patients (1.2%), catheter dislodge happen in 1 patient (0.6%), vessel injury was seen in 3 patients (1.9%), catheter related infection was found in 9 patients (5.6%), venous thrombosis was detected in 2 patients (1.2%) and catheter blockage in 12 patients (7.5%). A total of 8 catheters (5%) were removed due to complication. The rest of the catheters with complication were successfully treated and salvaged. **Conclusion:** The study showed that radiologically implanted venous access port catheters gave a reliable venous access with high successful implantation rate and low periprocedural complication which was comparable to other radiological and favorable to surgical results.

Key words: *Implantable venous access ports, periprocedural complications.*

1. INTRODUCTION

Venous access ports or chemoports are totally subcutaneous tunneled central venous access catheters. They are used as venous access for transfusion therapy like chemotherapy or total parenteral nutrition. Since the first demonstration of central venous catheterization by Werner Forssman in 1929, its usability has become more popular.

In patients undergoing chemotherapy, after several initial cycles, venous access would be a problem due to direct damage of the cytotoxic agent to the vessels. The implantable venous access port is a good alternative for long-term venous lines. They are easy to use and provide a good access to the circulation system.

Typically, interventional radiologist implants image-guided venous access ports. However in some centers, surgeon and oncologist also perform the procedure. The implantation of venous access port is considered as a short and relatively safe procedure, but there are still risks. The complications of this procedure, assumed as periprocedural complications, could be mild like a small hematoma at the implantation site or could be severe complications as pneumothorax, infection or catheter migration [1-2].

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In recent years, interventional radiologist, using image guidance under local anesthesia has increasingly popularized this new technique. In University Kebangsaan Malaysia Medical Center (UKMMC), interventional radiologist started image-guided port catheter implantation since late 2007. Cases of image-guided port implantation have been increasing steadily, but the complications have not been well described. This study aims to evaluate the periprocedural complication of this procedure.

2. LITERATURE REVIEW

In general, complications of central venous access are divided into 3 types [1]:

1. Periprocedural complication which occurs within 7 days and assumed to be due to or related to the procedures.

2. Early post-procedural which occurs between 7-30 days, such as catheter migration, catheter thrombosis, catheter leakage, and sepsis.

3. Late complication which occurs after 30 days, such as infection, venous thrombosis, catheter malfunction, catheter migration.

Besides complications due to drugs and contrast media used, periprocedural complication are implied to be related or due to the procedure, including: (i). Injury to surrounding structures: Inadvertent arterial puncture, pneumothorax, hemothorax, hematoma, injury to brachial plexus. ii. Device related: catheter dislocation, catheter migration, torsion of port reservoir, kinking of catheter. (iii). Those affected to cardiovascular system: cardiac arrhythmia, air embolism and cardiac arrhythmia. (iv). Infection: this early infection is believed to be due to breakdown of sterile technique during device placement leading to wound infection, skin necrosis, wound dehiscence [1-4].

In a study on placement of hemodialysis catheter, to define the periprocedural complication, the author didn't mention about time and the periprocedural complications are defined by listing one by one like excessive bleeding requiring transfusion, air embolus, pneumothorax, arrhythmia [5]. In the study with infectious complication of peripherally implantable venous access in HIV-positive versus HIV-negative patient, periprocedural complications are defined as those within 14 days after catheter implantation [6]. Another study in complications of Hickman catheter in HIV patient inserted radiologically, periprocedural complications are defined as those happening within a week after the insertion [7].

Different authors have different definitions of periprocedural complication with different periods of time. We decided to use 14 days post implantation as the time limitation for periprocedural complication as we believe procedure related complication should be manifested within 14 days.

3. OBJECTIVES

1. To determine the rate of periprocedural complications in patients having venous access ports inserted under image guidance in UKMMC.

2. To compare the complication rate between cases done in OT versus cases done in angiography suite.

3. Hypothesis

i. Null hypothesis: There was no increased complication in port implantations in angiography suite and operating theatre.

ii. Research hypothesis: There was increased complication rate in port implantations at angiography suite than operating theatre.

4. METHODOLOGY AND MATERIALS

This was a cross-sectional, retrospective, descriptive study of 18 months from January 2008 until June 2010 in Angio suite and in Operating Theatre of the Emergency Department, UKMMC.

4.1. Sample size:

The sample size was determined by the formula: $N=(z/\Delta)^2 \times p(1-p)$

$N= (2.58/0.05)^2 \times 0.05 \times 0.95= 126.46$, rounding to 127.

N: is number of sample

Z value=2.58 (for α error 0.01, two tailed or 99% Confidence Interval)

P=proportion of disease or factor under study (5%)

Δ=width of the confidence interval 0.05

4.2. Protocol for image guided venous access port insertion in UKMMC.

All patients must be admitted 1 day before procedure for screening test including renal profile, liver function test, coagulation profile with full blood picture or equivalent. The patient's Hemoglobin level should be more than 8 g/l. For those whose coagulation profiles were unable to be corrected, they would have FFP or platelet transfusion during procedure. Patient should be asked for any history of asthma and allergy. Corticosteroid should be given to the patient for allergy covering with 40 mg at 12hrs and 40 mg at 2hrs before the implantation. The procedure, possible complication of the procedure and usability of the catheter should be explained to the patients when getting patient's consent. On the day of procedure, patients have to fast at least 4 hours and the patient's consents must be confirmed again.

The procedure will be performed by Radiologist or by the Senior Radiology Trainee at angiography suite or in Emergency Department OT randomly depending on the patient list prepared by the staff nurse. A pre-procedure ultrasound will be done for venous assessment. The procedures have to be performed under aseptic condition. Povidine is used as disinfecting agent. Lignocain 2% is used for local anesthesia with maximal dose of 10 mls. In case of necessity for sedation, Dormicum 2 mg and Fentanyl 50 mg IV would be given to the patients. If the patients are children, the procedures were performed under GA.

The insertion site will be determined by the radiologists after venous assessment by ultrasound. Usually, the right IJV is chosen in typical cases. The alternative approaches include left IJV, left subclavian vein, translumbar puncture to IVC. After the local anesthesia is given, a small skin incision will be made at puncture site (2-4mm). Under U/S guidance, the puncture is made with 18G puncture needle. When the guide wire is inserted with its tip already within the IVC, the puncture needle is taken out and the guide wire is temporarily anchored. The port site and the tunnel are estimated by correlating the catheter on the chest wall under fluoroscopy. Usually, the right upper chest were chosen as subcutaneous port's pocket. The tunnel will be made after LA is given along the track. Tunneling of the catheter is then performed from the exit site (port's pocket) to punctured site with tracker. Some patients need using dilators before insertion of the peel-away sheath through the guide wire. After the guide wire is removed, the catheter should be inserted quickly when the patient is exerting Valhalla maneuver. The sheath is consequently peeled off. After obtaining the proper length for the catheter, the port will be connected to the catheter and implanted into the port pocket. It is advisable to make a suture for fixation of the port. Post-procedure fluoroscopy should be done to check catheter position and any complication. The tip of catheter after implantation should be located at the atriocaval junction. The skin will be closed usually by intradermal suture with Vicryl 3.0.

A single dose of prophylaxis antibiotics is given to the patient intravenously using cephalosporin 3rd generation (cefoperozone 1 g, 10-20 mg/kg for pediatrics). After implantation, the catheter care will be performed by ward's staff nurses. STO is usually on day 7-10 if applicable. No need STO for patient with intradermal sutures. After insertion, the port catheters can be used immediately. If patients are discharged, they are instructed to take care of the catheters, ports and will be given appointments for STO or chemotherapy.

4.3. Data acquisition

All patients underwent image guided port implantation in radiology department and in Emergency Department's OT from 01 Jan 2008 to 30th June 2010. Files of patient were reviewed for periprocedural complications within 14 days.

The required information were attained from UKMMC IRIS, PACS, data from angiography suite and operating theatre of Emergency Department. Patient's names and personal information were anonymous.

5. RESULTS

At the end of the study, a total of 161 procedures of port implantation done in 157 patients from June 2008 to June 2010. Most of the indications were for chemotherapy which were seen in 160

procedures (99.4%). Only one case had indication for TPN (0.6%) due to short bowel syndrome. In term of diagnosis, 84 procedures (52.2%) had diagnoses with early cancers, in this patient group, they were quite well. The rest of 77 procedures (47.8%) are of second group which was comprised of primary cancer in late stage (local or distant metastases), which were seen in 49 cases (30%), early cancer with other disease seen in 15 cases (9.3%), metastatic cancer with other disease in 12 cases (7.5%) and short bowel syndrome in 1 case (0.6%).

A total of 160 procedures (99.4%) had been administered IV prophylaxis antibiotics with a single dose peri-procedurally. One patient was not given antibiotics due to antibiotic allergy. Those with infected catheters were indicated 2-5 antibiotics from 10-20 days.

Distribution of patient's ages ranged from 3 to 76 years old with a mean of 49 years old. Most of them were adults with 158 cases (98.1%). There are 3 cases (1.9%) of pediatrics (Chart 1). Number of male patients are more compared to females with the male-to -female ratio of 1.2 : 1 (87:74) (Chart 2). There are 86 cases (53.6%) of Malay people, 65 cases (41%) of Chinese, 9 cases (5.6%) of Indian and 1 case (0.6%) of other races (Chart 3).

Most of the catheters were inserted via the right IJV punctures and the chemoports were located at the right upper chest wall which were found in 145 cases (90.1%).There were 16 procedures (9.9%) experienced alternative approaches which were in left IJV in 12 cases (7.5%), left subclavian in 3 cases (1.9%) and translumbar approach in 1 case (0.6%) depending on the patient status. In the total of 16 alternative approaches, 5 cases (3.1%) were due to disease location (4 right breast Ca, 1 right humerus Ewing sarcoma), 1 case (0.6%) got enlarged cervical lymph nodes compressing the right IJV, 1 patient (0.6%) was with necrotic metastatic lymph node causing skin ulcer, 7 cases (4.4%) had thrombosis of the right IJV and 2 cases (1.2%) had infection of previous right IJV catheters.

There were 8 catheters with usable period less than 2 weeks which were removed due to complication (5%). The rest of the patients (153 / 161) have usability period more than 2 weeks (95%).

A total of 4 procedures (2.5%) had technical difficulty during implantation due to venous thrombosis. Among them, three cases were successfully inserted (2 inserted after venoplasty, 1 experienced translumbar puncture). Only one implantation (0.6%) was abandoned because of extensive venous thrombosis in right IJV and both brachiocephalic veins. The successful implantation rate was 99.4% (160/161).

Total complications was seen in 22 patients (13.7%) including malposition, catheter dislodge, vessel injury, infection, venous thrombosis and catheter blockage (Chart 4). Among 22 complications, 8 patients (5%) required catheter removal. None of the patients were dead due to periprocedural complication. There was more propensity for patients with late cancers and complicated diseases to have complication than those with early cancers, with p value of 0.04. Comparing between the patients in OT and angiosuite, there was no relation between complication rates and venue to do the procedure, with p value of 0.715 (Table 1). There was association between catheter sites and complications, p value 0.0001. The patients with catheter in other sites tend to have more complication than patients with catheter in the right IJV. However, among 16 cases with alternative approaches, 11 patients have co-morbidities including right IJV thrombosis, right IJV compression, right neck ulcer. These co-morbidities may act as predisposing factors. This indicates study bias.

Malposition were found in 2 patients (1.2%). In the first case, the catheter had shrunken and coiled into the right IJV. It was also blocked and then was removed (Figure 1). The 2nd case had catheter kinking and blockage, however, it could be salvaged after adjustment and flush with heparinized saline (Figure 2). There was relationship between catheter blockage and malposition, p value 0.0001. However, the numbers of complication were small (1 cells have count less than 5, 1 cell is zero) which could contain type1 error.

Catheter dislodge was seen in 1 case (0.6%) which happened at the port-tube junction causing leakage few days after insertion. This catheter was removed.

A total of 3 patient (1.9%) had vessel injury whereby there were 2 cases of inadvertent arterial punctures and 1 case of venous perforation. The two patients with arterial punctures were hemodynamically stable and required only local compression. The other patient had contrast extravasation at the catheter tip in keeping with venous perforation (Figure 3). This patient also had venous thrombosis in the left brachiocephalic vein and the catheter was subsequently removed.

There were totally 9 cases (5.6%) of catheter infection, among which, 4 cases (3%) needed catheter explantation. The rest were successfully treated with antibiotics and salvaged. The most common pathogen was *Staphylococcus Aureus*, seen in 5 cases (31%). There were 5 cases of catheter infection having neutropenia. Statistical analysis showed that there was strong relation between infection and neutropenia with p value of 0.001 (Table 2). Those with neutropenia had more tendency to get catheter infection than those without neutropenia. There was also relation between infection and catheter blockage, with p value of 0.002. There was no relation between infection and venue of doing procedure (OT or Angiosuite), with p value of 0.689 (Table 3).

Venous thrombosis was detected in 2 patients (1.2%). Both of them had right IJV thrombosis when starting the procedure, thus they had to have alternative approaches. The first case developed thrombosis few days after procedure and become progressively worse (Figure 4A, 4B). The 2nd case had venous thrombosis at the left brachiocephalic vein with also venous injury at catheter tip causing extravasation (Figure 3), this catheter was removed. There was relationship between venous thrombosis and alternative catheter sites, p value 0.0001. However, the number of complications were small (1cell <5, 1 cell is 0) which were prone to errors. Moreover, some of these cases already had IJV thrombosis, therefore venous thrombosis in these patient could be attributed to a progression of right IJV thrombosis.

The most common complication in our study was catheter blockage which happened in 12 patients (7.5%). However, most cases were salvaged after adjustment and flush with heparinized saline. Only 3 catheters (1.9%) were removed due to blocked catheters. As mentioned above, there was relation of catheter blockage with catheter malposition, p value of 0.001 and infection, p value of 0.002. Another statistical relation was also seen between catheter blockage and alternative approaches. The patients with insertion at the other sites have more propensity to get blocked than those with catheters in the right IJV, p value of 0.0001.

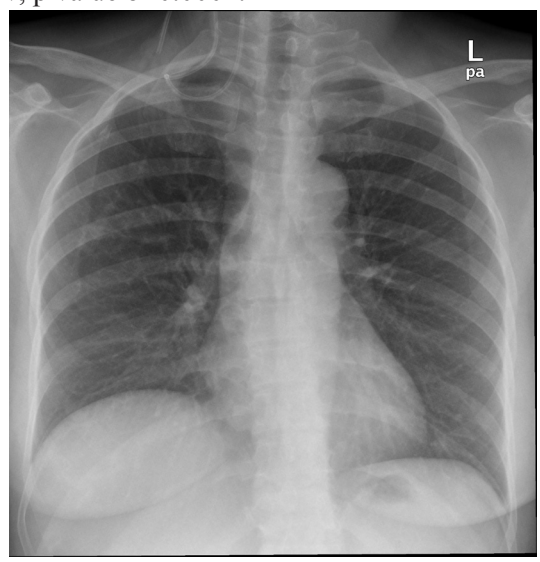

Figure 1. Catheter malposition. The catheter shrunk and coiled into the right IJV.

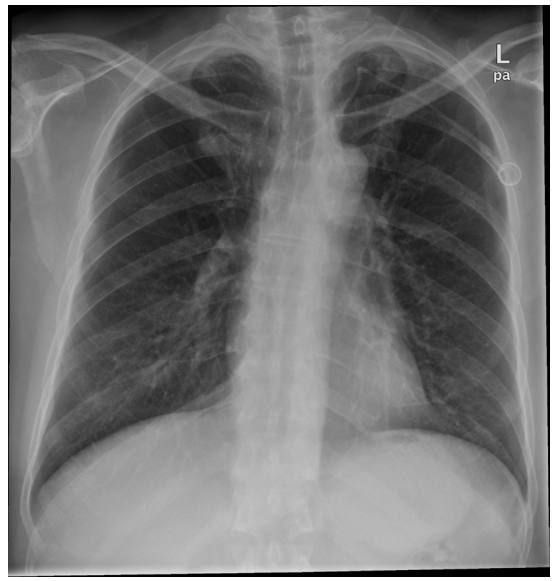

Figure 2. Catheter kinking

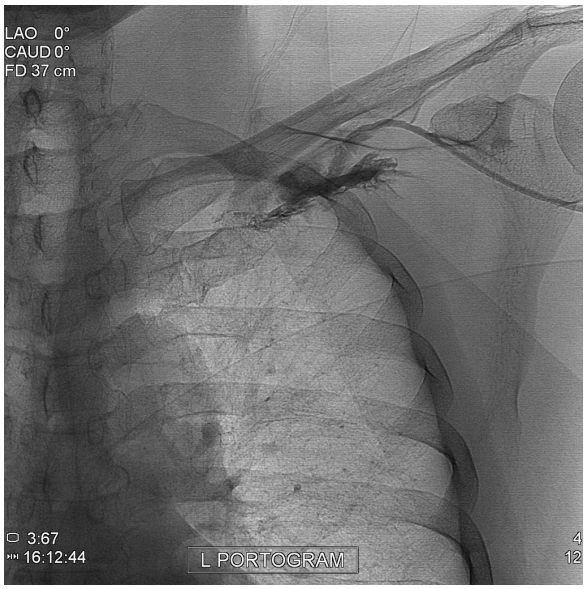

Figure 3. Vessel injury. Extravasation of contrast at the left brachiocephalic vein adjacent to the catheter tip suggestive of venous perforation. There was also left brachiocephalic venous thrombosis.

Figure 4. Venous thrombosis. The left brachiocephalic vein was not well opacified.

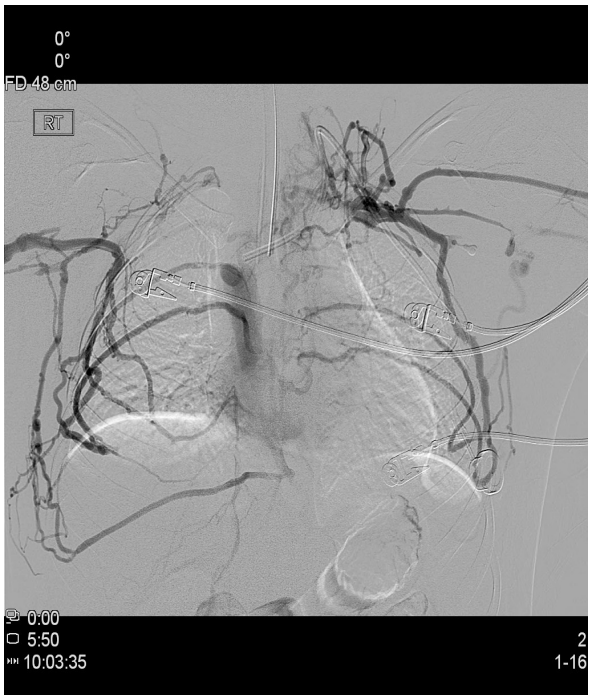

Figure 4. Venous thrombosis. After 6 months.

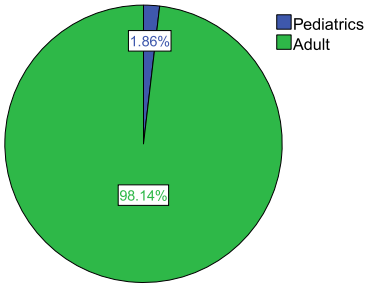

Chart 1. Age distribution

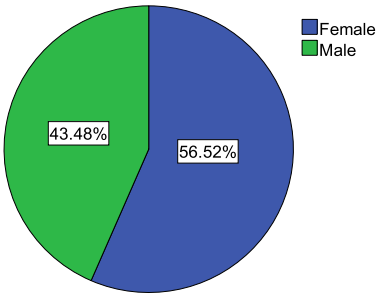

Chart 2. Gender distribution

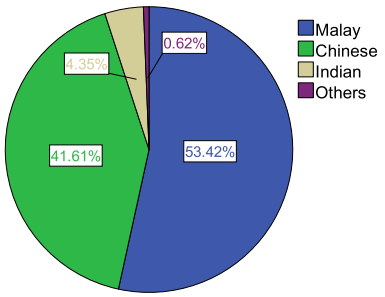

Chart 3. Race distribution

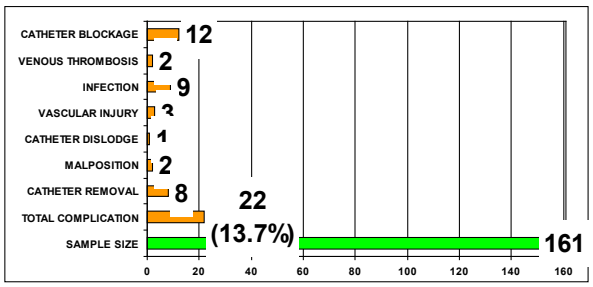

Chart 4. Complications

OTorANGIO * COMPLICATION Crosstabulation				
Count				
		COMPLICATION		Total
		No	With complication	
OTorANGIO	Angio	70	12	82
	OT	69	10	79
Total		139	22	161

Chi-Square Tests					
	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.133[a]	1	0.715		
Continuity Correction[b]	0.018	1	0.892		
Likelihood Ratio	0.133	1	0.715		
Fisher's Exact Test				0.820	0.447
N of Valid Cases	161				

Table 1. Correlation analysis of complication and venue of doing implantation

INFECTION * NEUTROPENIA Crosstabulation

Count

		INFECTION		Total
		No	Catheter infection	
NEUTROPENIA	No	132	4	136
	With neutropenia	20	5	25
Total		152	9	161

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.644[a]	1	0.001		
Continuity Correction[b]	8.636	1	0.003		
Likelihood Ratio	8.290	1	0.004		
Fisher's Exact Test				0.005	0.005
N of Valid Cases	161				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.40.

b. Computed only for a 2x2 table

Table 2. Correlation analysis of infection and neutropenia.

INFECTION * OTorANGIO Crosstabulation

Count

		INFECTION		Total
		No	Catheter infection	
OTorANGIO	Angio	78	4	82
	OT	74	5	79
Total		152	9	161

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.161[a]	1	0.689		
Continuity Correction[b]	0.003	1	0.954		
Likelihood Ratio	0.161	1	0.689		
Fisher's Exact Test				0.743	0.476
N of Valid Cases	161				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.42.

b. Computed only for a 2x2 table

Table 3. Correlation analysis of infection and venue of doing procedure.

6. DISCUSSION

When comparing between totally implanted port catheter and partially tunneled catheters (Hickman catheter), the complication rate in the total implantable port catheter was much less especially infection and thrombosis. The complication rate was as high as 45% in partially implanted catheter [8].

The radiologically implanted venous access port catheters has significantly higher successful rate which can be up to 100% [2]. Venous port catheter implantation can be performed by interventional radiologist quickly and safely that complication rates compare favorably with surgical results [9,10].

The successful rate of surgical cut-down using anatomical landmark was about 52-94% [11,12,13]. Other results in surgical publication were better which is 98.4-100% with this method. However, the complication rate of surgical insertion was higher. The cost of surgical insertion also higher contributed by OT room, anesthesiologist standby, nursing and assistant [14].

The major complication in long term follow-up wais about 16% as reported by an oncology team in 92 patients with implantable venous catheter inserted through the subclavian vein [15].

Many other studies in literature demonstrated the benefit of image guided procedure over the landmark technique in increase successful rate and reduction of complication [2,16,17].

A study of radiological port catheter implantation showed 100% in successful rate, periprocedural complication about 1.3% within 24hrs and 11.8% general long term complication with total explantation rate is 6.1% [18].

Another report of radiologically implanted venous access port by J Vardy [8], the periprocedural complication was about 13% within 24hrs, among which, 4% was for major complication including hemothorax and venous thrombosis, 9% were minor complication i.e. hematoma, severe pain.

Heike Lorch [9], in a study of 123 patients with 125 port catheter insertion radiologically showed that the technical successful rate was 100%. General immediate complication rate (<24hrs) is 11.2%, including hematoma, pneumothorax, catheter malposition, torsion of port-catheter, dehiscence the skin, brachial paresis. The total complication was 24.2% in long term follow-up [9].

Barbaros E. Cil [2] in a study of 37 pediatric oncology children who got radiological port catheter implantation, the successful rate was 100% and periprocedural complication was 0% within 24hrs. This report also showed a rate of catheter removal about 2.7% which was reported in surgical results in about 13-30% due to long term complication [2].

Complication rate depended on the complication definition. Most of studies defined early complication within 24hr. The longer the day of follow-up, the higher the complication rate, especially infection and venous thrombosis. Our overall periprocedural complication was 13.7% within 14 days which can be comparable with other radiological results ranging from 0% to 13% within 24hrs [2,9,8,18].

The most common complication in our study were catheter blockage (7.5%) but most cases were successfully salvaged. Only 3 cases (1.9%) needed catheter removal . The second most common complication was infection (5.6%) with only 4 cases (3%) need explantation. Others complications were rare including catheter malposition, dislodge, vessel injury and venous thrombosis.

In a study of permanent catheter for hemodyalysis, the catheter blockage was commonly due to catheter thrombosis. There was about 100% of central venous catheter have fibrin sheath at autopsy [19]. Adrew M [20] and Valerio D [21] showed the rate of catheter dysfunction about 35-67% of patient with long term catheterization. The longer the catheter last, the more risk of thrombosis sheath and catheter thrombosis. Catheter thrombosis was also related with infection and bacteremia [22]. Fortunately, most of catheter blockage is resolved after fibrinolysis and heparin administration [23]. Right IJV access also reduced venous thrombosis compared to approaches from subclavian veins. Even with venous thrombosis, the symptoms were less severe comparatively [24].

Infection was defined as local or systemic types. Local infection presented as inflammation symptoms along the catheter route. Systemic infection was defined as having septic symptoms without identifiable source and positive blood culture [25]. It was said that the non-tunneled catheter insertion has slightly less infection risk [26]. Infection rate depended on definition of complication. The study with periprocedural complication within 24hrs should have no infection [3,9,23]. These infectious complication were usually classified as early (<30 days) or late complications (>30 days) which can be as low as from 0.2% to 10% in long-term catheters. We believe catheter infection within 14 days was related to the sterile condition of the procedure.

In patient with HIV patient, the catheter related infection could be higher which was about 14% to 16.6% [27].

A report of patient with sickle cell disease showed that infection rate can be up to 57% in long term follow-up. *Staphylococcus Aureus* was the most common pathogen [28]. Some surgical reports showed infectious complication of about 10-20% [16].

Our catheter infection rate was 5.6% periprocedurally which was comparable to other results. Pathogenic agent of infection complication in our study was also *Staphylococcus Aureus* (33%).

Among our 9 patients with catheter infection, 5 cases had neutropenia, to which, catheter infection was strongly related. There was also association between catheter blockage and catheter infection which was also stated in other studies [3].

Our result showed very few cases of catheter malposition (2/161). In catheter malposition, the catheter can flip and coil into the right IJV, entering mammary veins, too long, too short or kinking. It was not difficult to correct malposition with non-tunneling catheter. However, with tunneling catheter, the catheter should be removed. It increased the risk of venous thrombosis and vessel injury [29]. Under fluoroscopy, this complication was minimized significantly by guiding the catheter placement to proper location. The catheter location can be checked and adjusted instantly before finishing the procedure.

Catheter dislodge was rare, it can occur with increase pressure of injection [3]. Our study also had only 1 case of catheter dislodge. The port can migrate tend to move downward along the pectoralis fascia or can rotate causing dislodge of port-catheter junction. It was advisable to do fixation of the ports with stitches especially in patient having loose subcutaneous soft tissue or when a large port pocket was made. During the procedure, it was important to check connection after plugging the catheter into the port hub and make sure the good connection between the two. Catheter flush with contrast was to check any leak before suturing.

Our rate of vessel injury was small and similar with other radiological results. Vessel injury highly depends on operator experience. Using of US and fluoroscopy make vessel approach easier and reduced significantly the artery inadvertent puncture. Venous injury can happen due to kinking of guide wire during insertion or due to catheter stiffness. The simple solution after puncture common carotid artery was to compress in 10 minutes. The puncture can be repeated if there is no or small hematoma. This complication were associated with arteriovenous fistula [30]. Rupture, dissection of the carotid artery and insertion of catheter into the carotid artery were also reported. These complication were rare but they might be fatal if happening. Using right IJV approach and micropuncture can reduce inadvertently arterial puncture [23].

Venous thrombosis usually happen in long term follow-up. In our study, there were 2 cases of venous thrombosis which were not commonly seen and plausible. Both of them had preexisting right IJV thrombosis which might act as predisposing factors. In long term follow-up, venous thrombosis was very common and can happen in about 35-67% of patients. Its pathophysiology could be i. hypercoagulopathy, ii. vessel injury , iii. slow flow. Hypercoagulation commonly happened in cancer or very ill patients. The endothelial layer can be injured proportionally to movement of the extremities. Catheter inserted at brachiocephalic and subclavian veins have more risk to have venous thrombosis than other faster flow like IJV. Anticoagulation can be administered, however,

the catheter should be removed if symptoms were persistent or become worse [31, 32].

Some other rare complications reported in other studies were not encountered in our study including pneumothorax, air embolism and arrhythmia.

Risk of pneumothorax is higher in children than adults because pleural refraction was higher than in adults [3]. Nowadays, when using of ultrasound becomes globally accepted, it makes this complication become rarer [33,34].

Air embolism can happen when puncture, injection, insertion of catheter through peel-away sheath. The hub of the catheter should be closed by a finger during waiting time for exchanging catheter and the catheter should be inserted during valsalva. If it happens, aspiration by catheter is suggested, patient should be in left decubitus position and administered 100% oxygen.

Transient cardiac arrhythmia can happen when the catheters or guide wires extend deep into the right ventricle or atrium. Cannulation of guidewires further into the IVC and proper catheter length were suggested to avoid this complication [3].

7. CONCLUSION

Radiologically implanted venous access ports had high successful rate and less complication which was favorably comparable to surgical results. This might reflex the benefit of image guidance.

Our study showed high successful rate (99.4%). The complication rate during our current practice was 13.7% which was comparable to other radiological and favorable to surgical results. There was relation of complication with disease stages and catheter sites. There was no increase in complication rate with using either OT or Angio suite.

Most common complication in our study was catheter blockage (7.5%) and most cases were successfully salvaged after adjustment and flush. Catheter blockage was associated with alternative catheter sites, catheter malposition and infection.

The second most common complication in our study was catheter infection (5.6%) which had strong relation with neutropenia. Using either OT or Angio suite had not increased infection rate.

Other complication including vascular injury, venous thrombosis, malposition, catheter dislodge were rare and ranging from 0.6 to 1.25%.

LIMITATION:

Patients had co-morbidities and predisposing factors reflecting study bias.

Number of complication were small, therefore the results may embed statistical errors.

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List of abbreviation:

EIR: Endovascular and Interventional Radiology.

UKMMC: University Kebangsaan Malaysia Medical Center.

IJV: Internal jurgular vein.

TPN: total parenteral nutrition.

OT: operation theatre.

CATHBLOCK: catheter blockage.

TECHDIFFICULTY: technical difficulty.

CATH: catheter.

FFP: fresh frozen plasma.

GA: general anesthesia.

LA: local anesthesia.

IVC: inferior vena cava.

STO: suture to out.

EIR: endovascular interventional radiology.

ED: emergency department.

IRIS: integrated radiology information system.

PACS: picture archiving and communication system.