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Editorial

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Prevention and Management of SIIP Complications with Caution and Safety

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The subcutaneous intravenous infusion port (SIIP) or totally implantable venous port (TIVAD) have been an enormous development in the field of oncology and consequently in many fields of medicine. From their first clinical use, these devices have had an enormous and incommensurable impact on the quality of life, especially in cancer patients. These devices offer them the opportunity of a continuous venous access that permits more reliable and effective treatments. These devices also changed in some way the approach to the patients suffering from cancer, as new and more active therapies have been developed. After many years these devices are not only used for cancer patients, but they spread for many diseases in which continuous intravenous therapies are required.

The method of catheter tip placement can be attempted using different methods. Chest X-ray film or fluoroscopy is one of the method that can be used especially if the SIIP is placed in operative room. This methods with its advantages and bias, permit to have an image about the right position of the tip of the catheter. This is fundamental, first of all to prevent all the related complications that can appears from the catheter occlusion until vena cava perforation [1]. Some external methods measurement if the catheter exist in order to avoid any radiological control. But between the methods that can be used is the less sure in order to join the right position for the tip of catheter and when possible should be avoided, especially for the neophytes. The malposition of the tip can be the cause of venous thrombosis so the visualisation of the correct tip position is mandatory. In this way X-ray film [2], fluoroscopy [3], peroperative intravasal electrographic control [4] can be preferred to external measurement of the catheter procedure.

The silk is usually used for internal sutures depending from the surgeons attitudes and habits. The fibrous scar can develop starting from silk suture and this do not permit to find the catheter, but the number of patients reporting this complications is not well specified [5]. The catheter need to be secured both with the entry side and with the exit side of the vein that is used to insert the catheter. When the vein is isolated the utilization of the silk is not recommended to suspend the vein it

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self, especially if will be then secured using the absorbable suture. The utilization of the silk represent a useless passage that can be avoided both for time sparing and to avoid the risk of involuntary silk utilization. When the ports placed in its subcutaneous position need to be fixed in order to avoid the rotation. Different kind of port exists with different number of hole to secure the port to the fascia. The minimum is three holes and the maximum is four. A minimum of three holes can be used to secure the port because one or two holes are insufficient to have a solid fixation and predispose to the rotation. Also migration of the port itself is very rare and the only cause is the incomplete fixation of the port at the fascia. 1 or 2 point are usually unable to prevent rotation or more rare migration. The suture usually has to be not absorbable.

No antibiotic is need to implant a SIIP [6] and this procedure may be performed in out patient department or in surgical clinic. This riflect the cost of the procedure and the different remboursement in each country. So antibiotic irrigation of the skin at the end of the procedure is empiric method that has any significance except in case in which this procedure should be studied and proved.

The length of the utilization of the port is an important factor concerning the thrombosis of the catheter. No evidence exist in the literature that nor the race, nor the frequent port infusion with heparin are able to prevent the catheter and/or venous thrombosis. Any evidence exists about the so called “heparinization” (flushing the catheter with diluted heparin). The amount of heparin that empirically is used is 1 cc (5000 I.U. in 10 ml of saline solution) [7] and 100 I.U. in 10 ml of saline solution is probably a very small amount of the heparin to prevent occlusion [5]. In literature are reported many schemes for heparinization of the catheter, but none has emerged as the best, which may explain the lack of general agreement [8]. However some chemotherapy regimens have need monthly reintroduction [8]. If the port-catheter is irrigated every 3 months is considered too widely spaced and the preference should be to irrigate the system every 3 o 4 weeks [7].

The SIIP is a closed system that is usually tested to resist a high pressure. Smaller syringes generated significantly more injection pressure than did larger syringes [9]. All the nurses and doctors know that the syringe with a small calibre as syringes with 1, 5 and 10 ml should be used very carefully. In fact they can develop a high pressure and this can damage all the system. Of course this can happen especially if exist occlusion at any level in the catheter line.

The methods of port insertion have been detailed during the years and they usually are chosen depending of kind of operator, site of positioning the SIIP, skill of the surgeon radiologists, anaesthesiologists, gynaecologists, oncologists, neurologists, and other specialists that have become interested in SIIP placement. Pneumothorax (Pnx’s) is a strong complication for SIIP implant. Pnx’s rate in literature comprised between 0.5% and 6% of cases [10]. This is the most life-threatening complication, with heavy clinical, economic, and psychological consequences when it occurs [11]. The surgical cut down and the percutaneous access US guided are the method that can prevent this complication. Usually, the insertion of the catheter is performed using fluoroscopy or ultra-sonography [US] as imaging support, and this manoeuvre may be successful although Pnx may equally occur. This could be related to a flaw in the technique of insertion depending from the training and the experience of the operator. Recently, ultrasounds have been systematically used by some groups to avoid these complications, although insertion of the catheter without imaging support may be successful in the majority of patient, thus avoiding additional costs of fluoroscopy or ultrasounds [12]. The lack of imaging guidance during the percutaneous procedure is difficult to justify clinically and ethically, but the use of US increases the duration and the costs of the procedure and it is not beneficial in all cases [13]. The blind subclavian vein access is a risk condition to develop this method that can have

a mortality rate [14]. If the other methods can be available this blind method should be avoided.

The pinch-off syndrome is a well established complication of the subclavian vein access to insert a SIIP and occurs with different incidence in the majority of the casuistic reported in the literature [15]. This syndrome caused by the compression of the catheter between the clavicle and the first rib due to poor site selection for insertion often seen as the "pinch off sign" on chest radiography [16] Inadequate catheter length between the portal outlet tube and the vein entry site could cause shearing at the portal-catheter junction. Very young patients under the age of one year old, small catheters, injection of caustic chemotherapeutic agents, and improper catheter care could also be risk factors for catheter rupture. Many methods have been reported to prevent this complications non one is a safe method to avoid it [17].

Infection of the port site and of the catheter are two different problems with two different mechanisms and two different solution problems. To avoid both these problems nurses have to be well trained in preparing the port access in a sterile manner and using the maximum of sterility during the introduction of the needle. Infection of the SIIP can occur without local signs, but with unexplained fever or systemic signs of sepsis. In this case, a quantitative blood culture should be obtained both through the SIIP itself and from a peripheral vein. SIIP's site infection can be treated with local wound care and systemic antibiotics [18]. Antibiotic therapy is needed if the diagnosis of catheter-related blood steam infection (CRBI) is performed. On the opposite, the infection of the port site can be managed by local therapy, in order to avoid the port ablation that have to be reserved to the case of failure.

Some studies present in the literature have not shown difference in presence of complication in relation to the different degree of the doctors performing this procedure. Experienced surgeons and resident in surgery can do the procedure with the same amount of complication [19].

Routine removal of SIIP after 12 months is to early. The follow-up for breast cancer range from da 22.8 to 91.2 months [20]. A period of study of 6 to 12 months is not long enough to study the evolution of the tumour. The reinsertion of a SIIP for another chemotherapy course for recurrent disease increases health care costs and worsens the quality of life of patients. Moreover a very long period of examinations permits to have the better results in terms of immediate but overall in terms of long terms complications of SIIP. Before to remove the catheter a Doppler ultrasound can give more information in relation to X-ray chest examination. Computerized tomogram of chest may provide significant help for those with upper extremity deep venous thrombosis. US with Doppler and colour imaging is applied to confirm the diagnosis recently. The main findings of colour-Doppler US are visualization of mural thrombi or incompressible veins, absence of normal blood flow or presence of turbulent blood flow. The rhythmic pulsation conducted from cardiac or respiratory movement may also disappear and shows imaging of increased venous collaterals. Colour-Doppler US is believed to show more sensitive in detecting the fibrin sheaths that covers the surface of catheter by visualizing the thicker tip of catheter or freely floating clot at there. In case of thrombosis the safe procedure can be scheduled in order to avoid major complications [21].

Surgical cut down in the right hands permits 100% achievements. The procedure is a safe without any possibilities of complications related with blind percutaneous procedure. Moreover the surgical skin incision is a mandatory procedure that have to be performed for all kind of procedure to positioning the port itself. For this reason the cephalic vein in the right surgical hands could be every time attempted and of course in case of failure the remnant procedure can be used [22].

Authors' Contribution

IDC conceived and designed the study and prepared the manuscript.
AT performed the literature search and prepared the manuscript.
All authors read and approved the final manuscript for publication.

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Conflict of Interests

The authors declare that there are no conflict of interests.

References

[1]. Di Carlo I, Pulvirenti E, Mannino M, Toro A. Increased use of percutaneous technique for totally implantable venous access devices. Is it real progress? A 27-year comprehensive review on early complications. Ann Surg Oncol 2010; 17: 1649-1956.

[2]. Narducci F, Jean-Laurent M, Boulanger L, El Bédoui S, Mallet Y, Houpeau JL, Hamdani A, Penel N, Fournier C. Totally implantable venous access port systems and risk factors for complications: a one-year prospective study in a cancer centre. Eur J Surg Oncol 2011; 37: 913-918.

[3]. Tannouri F, Chahine G, Elias E, Matar M, Naser F, Massoud M. Ultrasonography and fluoroscopy-guided insertion of subcutaneous intravenous infusion port. Prospective study over 120 patients. J Med Liban 2010; 58: 187-190.

[4]. Stas M, Mulier S, Pattyn P, Vijgen J, De Wever I. Peroperative intravasal electrographic control of catheter tip position in access ports placed by venous cut-down technique. Eur J Surg Oncol 2001; 27: 316-320.

[5]. Jan HC, Chou SJ, Chen TH, Lee CI, Chen TK, Lou MA. Management and prevention of complications of subcutaneous intravenous infusion port. Surg Oncol 2012; 21: 7-13.

[6]. Di Carlo I, Toro A, Pulvirenti E, Palermo F, Scibilia G, Cordio S. Could Antibiotic prophylaxis be necessary to implant totally implantable venous access devices? Randomized prospective study. Surgical Oncology 2011; 20: 20-25.

[7]. Di Carlo I, Cordio S, La Greca G, Privitera G, Russello D, Puleo S, Latteri F. Totally implantable venous access devices implanted surgically: a retrospective study on early and late complications. Arch Surg 2001; 136: 1050-1053.

[8]. Marnejon T, Angelo D, Abu Abdou A, Gemmel D. Risk factors for upper extremity venous thrombosis associated with peripherally inserted central venous catheters. J Vasc Access 2012; 9:0. doi: 10.5301/jva.5000039.

[9]. Hayward WA, Haseler LJ, Kettwich LG, Michael AA, Sibbitt W Jr, Bankhurst AD. Pressure generated by syringes: implications for hydrodissection and injection of dense connective tissue lesions. Scand J Rheumatol 2011; 40: 379-382.

[10]. Grannan KJ, Taylor PH. Early and late complications of totally implantable venous access devices. J Surg Oncol. 1990;44:52–54.

[11]. Di Carlo I, Barbagallo F, Toro A, Sofia M, Lombardo R, Cordio S. External jugular vein cutdown approach, as a useful alternative, supports the choice of the cephalic vein for totally implantable access device placement. Ann Surg Oncol. 2005;12:570–573.

[12]. Yip D, Funaki B. Subcutaneous chest ports via the internal jugular vein. A retrospective study of 117 oncology patients. Acta Radiol. 2002;43:371–375.

[13]. Mansfield PF, Hohn DC, Fornage BD, Gregurich MA, Ota DM. Complications and failures of subclavian-vein catheterization. N Engl J Med. 1994;331:1735–1738.

[14]. Aldrighetti L, Paganelli M, Arru M, Caterini R, Ronzoni M, Ferla G. Complications of blind placement technique in 980 subcutaneous infusion ports. J Vasc Access 2000; 1: 28-32.

[15]. Lin CH, Wu HS, Chan DC, Hsieh CB, Huang MH, Yu JC. The mechanisms of failure of totally implantable central venous access system: analysis of 73 cases with fracture of catheter. Eur J Surg Oncol 2010; 36: 100-103.

[16]. D'Silva K, Dwivedi AJ, Shetty A, Ashare R. Pinch-off syndrome: a rare complication of totally implantable venous devices. Breast J 2005; 11:83-84

[17]. Fazeny-Dörner B, Wenzel C, Berzlanovich A, Sunder-Plassmann G, Greinix H, Marosi C, Muhm M. Central venous catheter pinch-off and fracture: recognition, prevention and management. Bone Marrow Transplant 2003; 31: 927-930.

[18]. Schwarz RE, Groeger JS, Coit DG . Subcutaneously implanted central venous access devices in cancer patients: a prospective analysis. Cancer 1997; 79: 1635-1640.

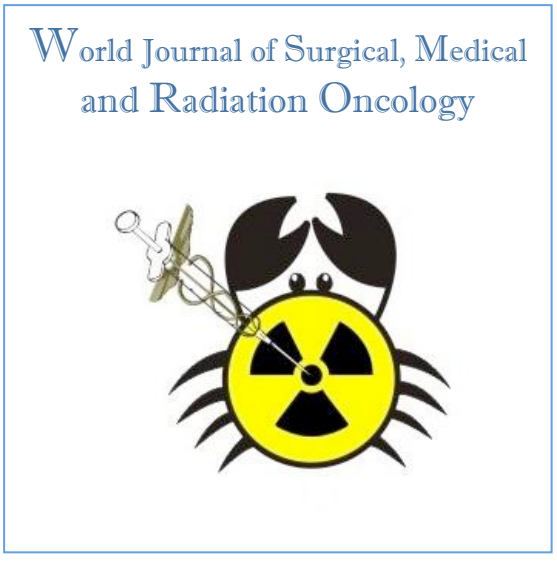
[19]. Di Carlo I, Toro A, Sofia M, Fasone MA, Barbagallo F, Russello D. Learning curve and early complications of totally implantable venous access devices: is tutoring the solution for the problem? G Chir. 2004; 25: 146-148.

[20]. Kong X, Moran MS, Zhang N, Haffty B, Yang Q. Meta-analysis confirms achieving pathological complete response after neoadjuvant chemotherapy predicts favourable prognosis for breast cancer patients. Eur J Cancer. 2011; 47: 2084-2090.

[21]. Lee JH, Kim YB, Lee MK, Kim JI, Lee JY, Lee SY, Lee EJ, Lee YS. Catastrophic hemothorax on the contralateral side of the insertion of an implantable subclavian venous access device and the ipsilateral

side of the removal of the infected port -A case report-. Korean J Anesthesiol 2010; 59: 214-219.

[22]. Di Carlo I, Toro A. Skin incision to implant the port: Could be this the real reason to prefer the surgical cutdown to implant a totally implantable venous access device? Ann Surg in press.



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