STUDY OF ADVANTAGES AND DISADVANTAGES OF TOTALLY IMPLANTABLE VENOUS ACCESS DEVICE

J. Ahmadi[1], M. Izadyar[2], B. Ashjaei[1*], M. Klantari[1], H. Nahvi[1], M. Joodi[1], M. Vali[1] and V. Mehrabi[1]

1) Department of Pediatric Surgery, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

2) Department of Pediatric Oncology and Hematology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

Abstract- Totally implantable venous access devices (TIVAD) or implantable catheter ports are devices which can be implanted subcutaneously. They enable prolonged and repeated access to the vascular system, into the peritoneal cavity or intravertebral space. This device is particularly useful for repeated medical injection, for blood sampling or transfusion of blood and blood derivatives and for total parenteral nutrition (TPN). Although many patients benefit from the insertion of TIVAD without any secondary effects, any surgical implantation can nevertheless lead to complications. In this study, we investigated the advantages and disadvantages of TIVAD catheter in pediatric age group. A total of 94 cases, 2 to 14 years old, were included in our study. We implanted TIVAD in these patients for chemotherapy in 83 cases (88.29%), for prolonged TPN in 6 cases (6.38%), for corticosteroid and antibiotic therapy after Kasai operation in 2 cases (2.12%), for intermittent IV therapy in 2 cases (2.12%) and for need to partial parenteral nutrition in 1 case (1.06%). Out of 94 cases, 14 cases (15%) had some kind of complications and 80 cases (85%) had no complication. There was no mortality. Most patients and their parents (82 cases, 87.23%) were satisfied from TIVAD. It seems that TIVAD can be a useful device for many chronic patients who need an IV access for multiple injections.

Acta Medica Iranica, 44(3): 199-202; 2006

Key words: Implantable venous access device, parenteral nutrition

INTRODUCTION

Critically ill patients and those who require total parenteral nutrition require prolonged or a permanent intravenous access. These patients are prone to infection, cellulites and other complications at the injection site (1). Insertion of totally implantable venous access device (TIVAD) is offered for these patients (2).

Even though many patients benefit from the insertion of TIVAD in the absence of any secondary effects, any surgical implantation can nevertheless lead to pre or postoperative complications (3). Some of these unwanted effects are: bleeding, arterial puncture or venous lesion (4), hemorrhage, hematoma, pneumo-thorax, hemothorax, hydrothorax, lesions affecting the thoracic duct, erosion of the skin due to the port (5), cutaneous necrosis in the implant area, irreversible catheter obstruction, rupture of the catheter, medicinal leakage into the tissues, infection, thrombosis, thromboembolism, thrombophlebitis, exteriorization of the implant, displace-ment of the port or catheter, endocarditis (6), disorders of cardiac rhythm and cardiac tamponade (6).

In this study we investigated the advantages and disadvantages of TIVAD catheter in pediatric age group.

Received: 22 Jun. 2005, Revised: 6 July 2005, Accepted: 24 July 2005

*** Corresponding Author:**
B. Ashjaei, Department of Pediatrics Surgery, Children Medical Center, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
Tel: +98 21 44806668, Fax: +98 21 44841862
E-mail: b_ashjaei@yahoo.com

MATERIALS AND METHODS

Our study was designed as a longitudinal analytical one. We inserted TIVAD for those patients who were referred to Children Medical Center of Tehran University from June 2000 to June 2005. A total of 94 cases were included in our study. Among these, 38 cases (40.42%) were male and 56 cases (59.57%) were female. We inserted TIVAD for chemotherapy in 83 cases (88.29%), for prolonged total parenteral nutrition in 6 cases (6.38%), for steroid and antibiotic therapy after Kasai operation in 2 cases (2.12%), for metabolic disorders and need for intermittent intravenous (IV) therapy in 2 cases (2.12%) and finally for administration of partial parenteral nutrition because of malabsorption in one patient with epidermolysis bullosa. We obtained informed consent from all patients or their parents.

Operative technique

The patient takes a shower and goes to the bath the night before surgery. One dose intravenous antibiotic is injected 30 minutes before starting the operation for skin saprophytes (often cefazolin 25 mg/kg). This technique is done under general anesthesia and supine position. A role is placed under the shoulder of the patient. Then preparation and drape are done from the ear to the xyphoid region on both sides of the patient. Two incisions are done, one for exploring the vein and another for inserting the port of the catheter. The site of exploring the vein and inserting the catheter is depends on the anatomy of the neck and chest and previous operation if it has been done (for example external or internal jugular vein cannulation in left or right side). The best place for inserting the port is on the lateral side of sternum in the same side of vein and under the clavicle (2-4 cm). After finding the appropriate vein we take two controls above and below the site of incision in the vein for inserting the catheter (Fig. 1). Then we indle the vein longitudinally with No. 11 scalpel for 1-2 mm, depending on the size of the catheter, and insert the catheter to the vein. The incised vein is then fitted around the catheter with a simple suture by prolone 7.0. Then we make a subcutaneous tunnel from vein to the place of insertion of the port (Fig. 2), and the end catheter is attached to the port that is placed in the subcutaneous pouch on the lateral side of the sternum (Fig. 3). After testing the outflow and inflow of the device, port and catheter are heparinized. The two incisions are closed (Fig. 4). Antibiotics are continued for 48 h after surgery (IV or oral).

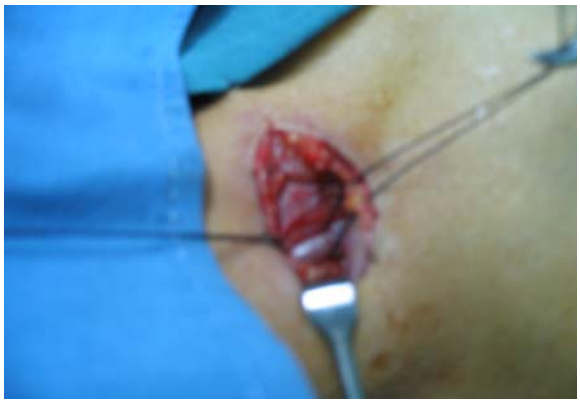

Fig. 1. Control of jugular vein.

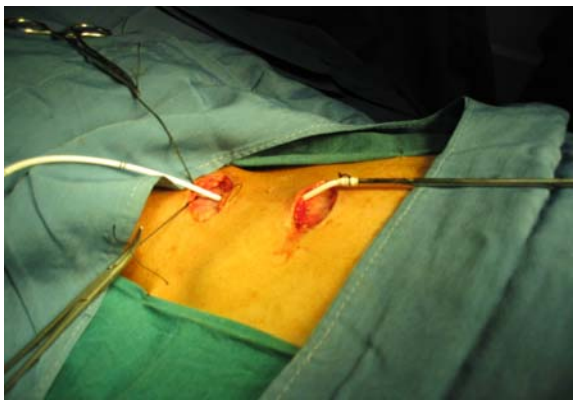

Fig. 2. Creation of subcuticular canal.

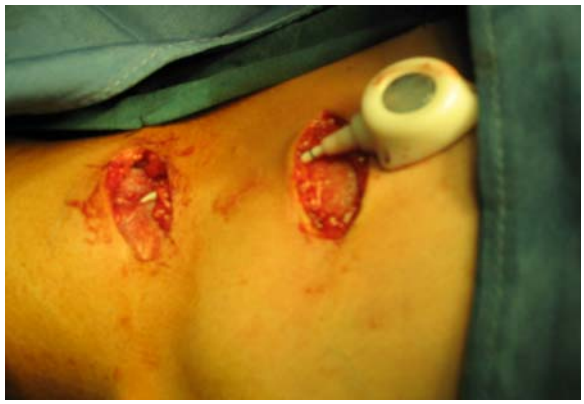

Fig. 3. Insertion of the port.

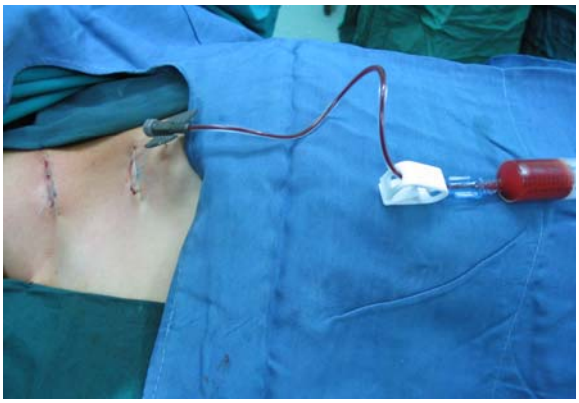

Fig. 4. Examination of outflow and inflow.

RESULTS

A total of 94 cases were included in our study. Out of 94 cases, we had irreversible complete obstruction in 4 cases, medicinal leakage into the tissues via the diaphragm of the device in 3 cases, withdrawal occlusion or outflow obstruction in 2 cases, exposure of port in 1 case and exposure of catheter in 2 cases. Infection occurred in 2 cases, wound dehiscence in 2 cases, hematoma in 2 cases, rupture of the catheter in 1 case, port and catheter disconnection in 1 case and extraction of catheter from central vein in 1 case (Table 1).

In 4 patients two or more complications occurred, therefore, 14 cases (15%) had some kinds of complications and 80 cases (85%) had no complication (Fig. 5) after implantation of TIVAD. Most patients or their parents (82 cases, 87.23%) were satisfied with TIVAD.

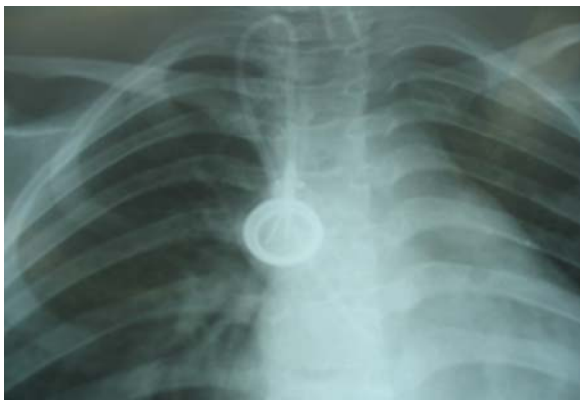

Fig. 5. Chest X-ray after insertion of totally implantable venous access device.

Table 1. Frequency of complications in patients who had TIVAD

Complication	No (%)
Irreversible obstruction	4 (4.25)
intramural thrombosis	2 (2.12)
fibrin formation at the end of catheter	1 (1.06)
kinking of catheter	1 (1.06)
Medicinal leakage via diaphragm of device	3 (3.19)
Withdrawal occlusion	2 (2.12)
Infection	2 (2.12)
early (1 w)	1 (1.06)
late (23 mo)	1 (1.06)
Wound dehiscence	2 (2.12)
Hematoma	2 (2.12)
Exposure of catheter	2 (2.12)
Exposure of port	1 (1.06)
Rupture of catheter	1 (1.06)
Port and catheter disconnection	1 (1.06)

Abbreviations: TIVAD, totally implantable venous access device.

DISCUSSION

From the past decades for management of patients who need multiple or prolonged IV therapy or multiple blood sampling, insertion of TIVAD catheter has been offered by medical doctors and specialists. By implantation of this device the peripheral veins of the patients are saved (3) and patients do not suffer from numerous injection sites that are needed for injection of drugs or recurrent sampling of blood.

This device is inserted in a central vein (1) and therefore it works for long time and also because of the wide surface of the port, every time, one needle is inserted into the port that can be used for sampling or injection of drugs at the same time. On the other hand, because of insertion into the central vein, injection of hypertonic solutions or drugs that are used for chemotherapy cannot damage the blood vessels (6). Therefore the patients can be satisfied with this device and we can help them feel better and improve their quality of life. We offer using TIVAD in any patient who needs prolonged IV injection or recurrent IV therapy or blood sampling (2, 3). In our study, out of 94 cases, we experienced no complications in 80 cases (85%) and 82 cases (87.23%) were satisfied with TIVAD.

Even though many patients benefit from the insertion of an implantable catheter port in the absence of any secondary effects, any surgical implantation can nevertheless lead to pre or post operative complications (4). The patients must be informed of the risks, unwanted effects and complications related to the surgery and the insertion of an implantable catheter port (6). Some of these complications are related to the surgery and the insertion of an implantable catheter port. Some of these complications can be solved by conservative management (4) or local anesthesia and in some cases we must extract the TIVAD and implant another one. In case which exposure of catheter or port had occurred we could solve this problem with local anesthesia and covering the catheter with skin flaps successfully. In cases which withdrawal occlusion was present we did not do any intervention, because of sufficient inflow. In cases in which infection had occurred, we extracted the device. In cases in which complete obstruction had occurred, we changed the place of the device. In these patients the entrance of catheter was external jugular vein. In the cases in whom medicinal leakage had occurred from diaphragm (all 3 TIVAD were manufactured in one company), we extracted the port and implanted another one. When port and catheter disconnection, wound dehiscence or hematoma occurred we solved the problem with local anesthesia.

We suggest the following in implantation and maintenance of port catheter: 1) prophylactic antibiotic, 2) preparation and drape for sterilization, 3) internal jugular vein is better than external jugular vein for insertion of the catheter, 4) in cases in which exposure of catheter occurs extraction of catheter is not compulsory and this problem can be solved with local anesthesia and covering the catheter or port with skin flaps, and 5) in withdrawal occlusion any extra interventional procedure is not necessary and that catheter can be used for injection.

We conclude that, we must select reliable TIVAD that is produced from nonthrombogenic materials with high resistance to tearing and high flexibility.

Conflict of interests

We have no conflict of interests.

REFERENCES

1. Biffi R, de Braud F, Orsi F, Pozzi S, Mauri S, Goldhirsch A, Nole F, Andreoni B. Totally implantable central venous access ports for long-term chemotherapy. A prospective study analyzing complications and costs of 333 devices with a minimum follow-up of 180 days. Ann Oncol. 1998 Jul; 9(7):767-73.
2. Raj A, Bertolone S, Bond S, Burnett D, Denker A. Cathlink 20: a subcutaneous implanted central venous access device used in children with sickle cell disease on long-term erythrocytapheresis--a report of low complication rates. Pediatr Blood Cancer. 2005 Jun 15; 44(7):669-672.
3. Filippou DK, Tsikkinis C, Filippou GK, Nissiotis A, Rizos S. Rupture of totally implantable central venous access devices (Intraports) in patients with cancer: report of four cases. World J Surg Oncol. 2004 Oct 19; 2(1):36.
4. Rutherford RB. Rutherford vascular surgery. 5th edition. Philadelphia: W.B. Saunders Company; 2000.
5. Ashcraft KW, Murphy JP, Sharp RJ, Sigalet DL, Snyder CL, editors. Ashcraft pediatric surgery. 3rd edition. Philadelphia: W.B. Saunders Company; 2000.
6. O'neil JA, Rowe MI, Grosfeld JL, Fonkalsrud EW, Coran AG, editots. O'neill Pediatric Surgery. 5th edition. St. Louis: C.V. Mosby 1998.