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Implantations of Central Venous Ports with Chest Catheter Insertion Via the Subclavian Vein in Oncology Patients: A Single Center Experience

Onkoloji Hastalarında Göğüs Duvarı Yerleşimli Santral Venöz Kateter Uygulamaları: Tek Merkez Deneyimi

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SUMMARY

Evaluation of safety, comfortability and reliability of implantable venous port catheter insertion via the subclavian vein in oncology patients and complications of subcutaneous venous chest ports in adult patients. Port catheter was inserted in 132 patients via subclavian vein, from November 01, 2006 to February 15, 2009. Of the 132 patients, 61 (46%) were men and 71 (54%) were women. The mean age was 55.8 (range: 18-86). Mean duration of cathetere stay was 255 days (range: 30-1150 catheter days). In 21 (15.5%) procedures, the following related complications occured (pneumothorax in five, infections in five, arterial punctures in nine, obstruction in one, breakage of catheter in one). Procedure related early complication rate was 10.3% and late complications occured at a rate of 5.1%. Catheter removal was required in three patients due to two catheter infections and one spontaneous breakage of the catheter. In the vast majority 97.8% n =129) of the patients the device has still been functioning normally. The results indicate that the use of a totally implantable venous access system insertion via subclavian vein is a comfortable and reliable method for chemotherapy administration and nutrition. However, central venous catheters are associated with a number of potentially serious complications and can be cosmetically distressing.

Key Words: *Venous port, oncology, subclavian vein, complication.*

ÖZET

Bu çalışmada amaç uzun dönem damar yolu açıklığının sağlanması; beslenme veya kemoterapi gereken erişkin onkoloji hastalarında göğüs duvarına implante edilebilir port kateterin güvenlik, uygunluk, konfor ve komplikasyonlarının değerlendirilmesidir. 01 Kasım 2006-15 Şubat 2009 tarihleri arasında 132 hastaya subklavyen ven yoluyla port kateter yerleştirildi. Bu 132 hastanın, 61 (%46)'i erkek ve 71 (%54)'i kadındı. Ortalama yaşları 55.8 (18-86) idi. Kateterin ortalama kalış süresi 255 gün (30-1150 kateter günü) olarak belirlendi. İşleme ilişkin 21 (%15.5) komplikasyon oluştu (beş pnömotoraks, beş yara yeri enfeksiyonu, dokuz arter ponksiyonu, bir kateter tıkanması, bir kateterin koparak kırılması). İşleme bağlı erken komplikasyon oranı %10.3 ve geç komplikasyon oranı %5.1 olarak kaydedildi. Kateter iki hastada infeksiyon ve bir hastada koparak kırılma nedeniyle çıkartıldı. Kateter hastaların büyük çoğunluğunda (n =129, %97.8) fonksiyonel olarak çalışmaktadır. Subklavyen ven yolu ile tamamen implante edilebilir venöz port takılması işlemi kemoterapi ve beslenme için güvenli ve konforlu bir yoldur. Bununla birlikte, potansiyel ciddi komplikasyonları ve kozmetik sıkıntıları da beraberinde getirebilmektedir.

Anahtar Kelimeler: *Venöz port, onkoloji, subklavyen ven, komplikasyon.*

INTRODUCTION

Venous access is a problem for the patient receiving intermittent long term infusion theraphy for malignant tumors. Since Niederhuber first introduced totally subcutaneous implantable port catheter system in 1982, this procedure has been increasingly used in malignancy patients as a systemic chemotherapy access (1). Implantable subcutaneous venous port (ISVP) is usually implanted via subclavian vein or internal jugular vein. However, this may differ according to personal and institutional experience (2-4). ISVP represents a more comfortable alternative with lower prevalance of septic complications in oncology patients as compared with Hickman or Broviac type catheters (5-7). The aim of this study was to evaluate the practicability, complication rates and safety of venous port implantation with chest catheter insertion via subclavian vein and complications of the totally implantable venous ports in oncology patients.

PATIENTS and METHODS

One hundred thirty two cancer patients have been treated with chemotherapy after insertion of ISVP (Polysite Perouse Laboratoires Ivry Le Temple France, 8F silicone OD/ID of the catheter (mm) 2.4/1.2) in the period between November 01, 2006 and February 15, 2009. Before ISVP insertion, age, gender, main diseases, implantation side, complications, the reason and date of catheter removal were recorded. In total, 135 venous ports were inserted in 61 (45%) male patients and 71 (55%) female patients with a mean of 55.8 years (range: 18-86). The details of port use were shown in Table 1. Each patient underwent the placement of a single type of ISVP made of titanium connected to (8F) a silicon rubber catheter inserted via subclavian vein. ISVP was implanted to provide a long term intravenous access for chemotherapy and parenteral nutrition. The catheters were placed to right subclavian vein in 103 patients and left subclavian vein in 32 patients. All devices were inserted via a tunnel under the skin to the anterior chest wall under local anesthesia in the operating room using the seldinger method with intraoperative X-ray guidance. The catheter tip was placed via subclavian vein to superior vena cava or in the proximale right atrium in all patients. (Figure 1). All the ports had single lumen catheters and were controlled with easily flushed blood withdrawn from line before and after use. After the procedure, the catheter was filled with a solution containing of 0.2 mL heparin (100 U/mL) and 5 mL of 0.009 NaCl and thus was protected from obstruction. Catheters were flushed once in two weeks or monthly if patients were given monthly chemotherapy or had catheter insitu. All the patients were checked after insertion of the catheter with chest X-ray to see whether it is complicated or not. Outpatients were sent home after four hours. The complications related to port implantation were recorded: early after the first chemotherapy application. The numbers and reasons of the catheter removal were also recorded. Infection was defined as a local inflammation at the catheter exit site, and subcutaneous infection was due to the catheter. There was no catheter related blood stream infection. All patients were treated orally with simple first step antibiotics. Obstruction was defined as the inability to draw blood on infused solution into catheter. Displacement or cut-off was defined as the migration of the catheter or total breakage of it from the original place.

Table 1. The details of port use.

Number of patients	132 patients
Number of ports	135
Number of complications	21
Devices removed because of complications	3
Devices still functioning	55
Exitus	77 patients
Day insitu in average (follow-up)	255 days
Range	30-1150 days

Figure 1. X-ray showing catheters inserted via subclavian vein.

RESULTS

In total, 135 catheters via subclavian vein were inserted in 132 patients. Tumor diagnosis was as follows: colorectal cancer in 40 patients, breast cancer in 26 patients, gastrointestinal cancer in 21 patients, endocrin system cancer in 15 patients, upper and lower airway cancer in 14 patients, sarcomas in six patients, hematopoietic cancer in three patients, genitourinary cancer in two patients, other cancers in four patients and cancer of unknown origin in one patient. In 21 (15.5%) procedures related complications occurred (Table 2). Average duration of catheter usage was 255 days (range: 30-1150 catheter days). The duration of the follow-up period was limited life expectancy of the respective patient and it was 8.5 months on average (range: 1-26 months). As early complications, pneumothorax developed immediately after the procedure in five patients and arterial puncture in nine patients. Tube thoracostomy was needed for in three patients with pneumothorax and arterials were compressed in patients with arterials puncture. As late complications, infections developed in five patients, obstruction of the catheter in one patient, and breakage of the catheter in one patient. Microbiological examination identified methicillin-sensitive *Staphylococcus aureus* (MSSA) as the source of the infection in three patients. Cultures were negative in the remaining two patients. We successfully treated them with antibiotics. Two of those patients and a patient whose catheter broke and port migrated to right ventricle underwent a second port placement in the contralateral subclavian vein. We did not consider a surgical intervention for the patient whose catheter was broken because of low life-expectancy and poor general status for anaesthesia. Thus, the rate of port removal was 2.6/1000 catheter days (n =3). In 97.8% (n =129) of the patients the device functioned normally as long as they lived.

Table 2. Complications.

Early complications related to port implantation:	**(10.3%)**
Pneumothorax	5 (3.7%)
Arterial puncture	9 (6.6%)
Late complications related to port implantation:	**(5.1%)**
Breakage of catheter	1 (0.7%)
Obstruction of catheter	1 (0.7%)
Infection	5 (3.7%)

DISCUSSION

Implantable subcutaneous venous ports are used more and more frequently in oncology patients. Many oncology patients require a long-term central venous access for the administration of intravenous medication and nutritional support (8,9). They have great advantages over tunnelled catheters in terms of low infection rates, long patient life, patient comfort and ambulatory treatment (5-7,10). The devices most widely used currently are externalised Hickman type catheter and subcutaneously implanted port-a-cath. Both devices are equally safe and reliable for vascular access in adults (5,7,11). However, there are several rare but still important complications associated with permanent central venous catheters (12). Early complications are accidental arterial punctures, pneumothorax, haemotoma and air embolism (13). But, we have often experienced long term complications occuring during the use of catheters in daily routine care. According to the literature, there is no uniform definition of long term complications.(14). In a retrospective analysis on 225 port catheter system applications Yildizeli et al. defined long term complications in 6.6% of the cases: infections (2.2%), thrombosis (1.3%), extravasation (1.3%) and catheter breakdown (1.8%) (15). Many studies reported that overall infection rate was 0.4-1.5/1000 catheter days for port-a-cath catheters and long term catheter complication ranged from 0.6 to 27% (11,14,16). Our study showed that port-a-caths were associated with infection complications in five patients (3.7%) (4.3/1000 catheter days). The rate of symptomatic upper extremity deep venous thrombosis in most surgical studies using subclavian approach for port implantation is 0.4/1000 catheter days (6,8,17). However, we cannot make any conclusions regarding the incidence of thrombosis because we did not routinely examine asymptomatic patients by means of sonography. In addition, we did not see upper deep vein thrombosis in patients whose catheters were inserted via subclavian vein. The puncture of subclavian vein is associated with pneumothorax at a rate of 0.6-4.3% in the published studies (7-9). Pneumothorax developed at a rate of 2.7% in our patients (4.3/1000 catheter days). A "pinch off syndrome" may occur in ports placed through the subclavian vein secondary to the pinching of the port catheter between the clavicle and first rib leading to catheter fracture (10,18). The catheter broke in one patient and migrated the right ventricle. We did not perform an interventional surgery because of low life-expectancy and poor gene-

ral status. In this patient, proximal piece of the catheter was removed and a new catheter was inserted left subclavian vein. Other institutions have reported a higher prevalence of approximately 1% (19,20). We experienced this complication only in one patient (0.7%).

Intravenous port catheters have long working lives, relatively low rate of complications and comfortable usage for the patients who need long-term or periodic intravenous treatments. However, central venous catheters are associated with a number of potentially serious complications and can be cosmetically distressing. The results correlate with results of the literature (3,7,10,18). The placement of the devices under the anterior chest wall skin allows the patient to maintain a normal life style and its special maintenance does not need medical care except the monthly flushing with heparinised serum infusion by the chemotherapy nurse.

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