Comparison of Implantable Central Venous Ports: Subclavian Versus Juguler Access

Onkoloji Hastalarında Subklavyen ve Juguler İmplante Edilebilir Santral Venöz Portların Karşılaştırılması

İmplante Edilebilir Santral Venöz Portların Karşılaştırılması / Comparison of Implantable Central Venous Ports

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Özet

Amaç: Günümüzde, implante edilebilir santral venöz portlar (İSVP) kritik onkoloji hastalarında kemoterapi ve sıvı desteği, kan ürünleri ve parenteral nutrisyon ürünleri gibi diğer intravenöz tedavilerin verilebileceği, kolay erişilebilir damar yolu sağlamak için giderek artan sıklıkta kulllanılmaktadır. Bu çalışmada biz, deneyimlerimizi, onkoloji hastalarında subklavyen (SV) ve juguler venöz (JV) girişimin etkinliği ve komplikasyonlarının sıklığını ve karşılaştırmasını sunuyoruz. Gereç ve Yöntem: Kasım 2006 ve Haziran 2009 tarihleri arasında kliniğimizde, ortalama yaşları 56.66 (18-86) olan 145 (66 erkek, 79 kadın) hastaya subklavyen ven yolu ile, ortalama yaşları 56.81(19-81) olan 165 hastaya (75 erkek, 90 kadın) ise juguler ven yolu ile toplam 310 İSVP takıldı. Bulgular: İSVP nedeniyle mortalite gözlenmedi. Erken komplikasyonlar olarak; 34 hastada arteryel ponksiyon, yedi hastadada işlemden sonra sırasında pnömotoraks gelişti. Geç komplikasyon olarak; 10 hastada kateter yeri enfeksiyonu, bir hastada kateter kırılması, bir hastada kateterin yerinden başka yere kayması, bir hastada juguler ven trombozu görüldü gelişti. Kateterin toplam hastada kalma süresi SV grupta (41610 kateter gün), JV grup (23861 kateter gün) ile karşılaştırıldığında önemli derecede yüksek orandaydı (P=0.000). Tartışma: Deneyimimize göre; SV grupta kateterin daha uzun kalmasına rağmen, iki grup arasında kateter komplikasyonları açısından bir fark yoktu (komplikasyon sayıları SV grupta 28, JV grupta 28). Unutulmamalıdır ki, bu çalışma tek merkezli ve sınırlı sayıda hasta grubu içeren bir çalışmadır ve yeni ve daha iyi uzun süreli damar yollarını belirlemek için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler

Santral Venöz Girişim, İmplante Edilebilir Port, Eksternal Juguler Ven, Subklavyen Ven.

Abstract

Aim: Today, implantable central venous ports (ICVP) are increasingly used in oncology patients and provide easy vascular access for delivery of chemotherapy, other intravenous treatments, as fluids, blood products and parenteral nutrition solutions. In this study, we present our experience and comparison of efficacy and incidence of complications between subclavian versus jugular access in oncology patients and provide easy vascular access for delivery of chemotherapy. Material and Method: Three hundred ten implantable central venous ports (ICVP) were implanted via the subclavian vein (SV) in 145 patients (66 men, 79 women) with average age of 56.55 (18-86) and were implanted via the external jugular vein (EJV) in 165 patients (75 men, 90 women) with average age of 56.81 (19-81) between November 1,2006 and June 3, 2009. Results: There was no mortality caused by ICVP. As early complications, pneumothorax developed immediately after the procedure in 7 patients and arterial puncture in 34 patients. As late complications, infections developed in 10 patients, breakage of the catheter in one patient, malposition of catheter in one patient, jugular vein thrombosis in one patient. There was significant higher rate total implantation time in SV group (41610 catheter days) comparing with EJV group (23861 catheter days) (p=0.000). Discussion: According to experience, there was no difference rates of complication of catheter between the two groups despite a longer stay in SV group (complication numbers 28 in SV group, 28 in EJV group). It should be noted that this study took place at a single centre experience with a limited number of cases included and more research needs to be done to determine new and better ways to long-term vascular access.

Keywords

Central Venous Access, Implantable Port, External Jugular Vein, Subclavian Vein

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Introduction

Today, implantable central venous ports (ICVP) are increasingly used in oncology patients and provide easy vascular access for delivery of chemotherapy, other intravenous treatments, as fluids, blood products and parenteral nutrition solutions. There is bias the best choice for ICVP insertion in oncology patients. No well conducted randomized studies have compared complications related to the subclavian vein and the jugular vein interventions. In many prospective studies, there is biased by a preference given to one intervention over the other as experience of the surgeon or other causes. However, in clinical studies who are not properly randomized, there is a risk of selection bias and this may be led to overestimation of the effect of study. Another problem nonrandomized studies is unequal group sizes. Thereby we choosed chose implantation to the first group via the subclavian vein and after to the next group via the jugular vein and presented our experience and comparison of efficacy and incidence of complications between subclavian versus jugular access.

Material and Method

Three hundred ten ICVP were implanted via the subclavian vein (SV) in 145 ports patients (66 men, 79 women) with average age of 56.55 (18-86) and were implanted via the external jugular vein (EJV) in 165 ports patients (75 men, 90 women) with average age of 56.81 (19-81) between November 1, 2006 and June 3, 2009. A single type port was used in all patients (Perouse Laboratoires Ivry Le Temple France, 8F silicone OD/ ID of the catheter (mm) 2.4/1.2). All catheters were inserted by the same surgical team. ICVP was implanted to provide a long term intravenous access for chemotherapy and other intravenous treatments, as fluids, blood products and parenteral nutrition solutions in cancer patients. The catheter tip was inserted via SV or EJV into the superior vena cava (SVC) or into the proximal right atrium (PRA). All devices were implanted via a tunnel under the skin to the anterior chest wall under local anesthesia in the operating room using the Seldinger method. The catheter is manipulated under the fluoroscopy until the tip of the catheter is in correct position (same position as both ways). A catheter with its tip ranging from the middle third of the SVC to the PRA was evaluated acceptable. A catheter if any other position was considered repositioned. Right side was used initially in all patients except in SV group in 33 patients and EJV group in eight patients.. The insertion port for SV is the right middle infra subclavian area from the junction of the outer clavicle to the lowest landmark of the suprasternal notch and for EJV, the patient is placed in trendelenburg position with face turned to left side to well exposed right EJV. In patients who had undergone mastectomy, previous surgery of the head and neck, structural anomalies, etc, the contralateral side was preferred. Outpatients were sent home after four hours. 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 (100U/ml) and 5 ml of 0.009 NaCI and thus was protected from obstruction. Catheters were flushed once in 2 weeks or monthly if patients were given monthly chemotherapy or had catheter insitu. Information on port detail indications, complications, duration of stay, reasons of the catheter removal and statistically analysis of data were reported by retrospectively from patient records. The complications related to port implantation were recorded: early complication (before the first chemotherapy application) and late complication (after the first chemotherapy). The function of ICVP was controlled at each application by experienced staff. Chest X ray was done when the system could be obstruction obstructed. Obstruction was defined as the inability to draw blood on infused solution into the catheter. Displacement or cut-off was defined as the migration of the catheter or total breakage of it from the original place. All the catheters were inserted for chemotherapy and central venous access. Table 1 shows the baseline information for SV and EJV catheters. Infection was defined as a local inflammation at the catheter exit site. and subcutaneous infection was due to the catheter.

Descriptive statistics were used, including mean ± standard deviation, median and range, frequencies and proportions. Differences between proportions were tested with the chi-square test or Fisher's exact test as appropriate. For statistical analysis, non-parametric tests, Student's t-test and Logistic Regression were used (SPSS, version 17.0, SPSS Inc., Chicago, IL, USA). P values were two-tailed and results less than 0.05 were considered statistically significant.

Table 1. The baseline information for SV and EJV catheters

Variables	SV	EJV	p
Ports	145	165	
Male/Female	66/79	75/90	0.991
Mean age (years)	56.55 (18-86)	56.81(19-81)	0.680
Total catheter days	41610 (4-913)	23861(2-426)	0.000*
Mean time of use (days)	286.9	144.6	
Removal after the end of therapy	0	0	
Removal for complication	4	3	
Exitus	55	133	0.000*

*p values analysed by Mann-Whitney U test (p<0.05)

Results

There was no catheter related blood stream infection. Among the seven patients whom undergone port removal due to complications, second port was inserted (infection in 4 patients, malposition of catheter in one patient, jugular vein thrombosis in one patient, obstruction of catheter in one patient). In SV group 55 patients and in EJV group 133 patients died due to progression of their primary cancer during follow-up. There was no mortality caused by ICVP. Complications were summarized in table 2. There was no observe procedure related early infection. Late infection occurred in 11 patients. Microbiological examination identified methicillin-sensitive staphylococcus aureus(MSSA) as the source of the infection in three patients. Cultures were negative in the remaining eight patients. We successfully treated them with antibiotics. We didn't consider a surgical intervention for the patient whose catheter was broken because of low life-expectancy and poor general status for anesthesia. In this patient, proximal piece of the catheter was removed and new catheter was inserted left into the subclavian vein.

Table 2. Complication of two groups

Complication	SV Group	EJV Group	p
Arterial puncture	14 (9.7%)	20 (12.1%)	0.488
Infection	7 (4.8%)	4 (2.4%)	0.254
Pneumothorax	5 (3.4%)	2 (1.2%)	0.258
Breakage of catheter	1 (0.7%)	0 (0%)	
Obstruction of catheter	1 (0.7%)	0 (0%)	
Malposition of catheter	0 (0%)	1 (0.7%)	
Thrombosis	0 (0%)	1 (0.7%)	

* p values analysed by Chi-square test (p<0.05)

Discussion

Many oncology patients require easy vascular access for delivery of chemotherapy, other intravenous treatments such as fluids, blood products and parenteral nutrition solutions [1,2]. They have great advantages over tunnelled catheters in terms of low infection rates, long patient life, patient comfort and ambulatory treatment [3-5]. In many authors and institution the anatomical site of central venous approach is chosen according to personal experience rather than on evidence based guidelines [6]. However, no sufficient designed randomized studies have compared complications and usefulness related to EJV and SV approaches. However, there are several rare but still important complications associated with permanent central venous catheters [7]. Early complications are accidental arterial punctures, pneumothorax, hematoma and air embolism [8]. The latter late complications include infection, thrombosis, and mechanical causes. In a retrospective analysis on 225 port catheter system applications Yildizeli and 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%) [9]. We founded the rate of overall complication 19.3% in the SV group and in 16.9% in the EJV group. The rate of mechanic complications (arterial puncture, pneumothorax, hemothorax, mediastinal hematoma, nerve injury) had reported 0-12% in current studies [10,11]. We recorded that the rate of mechanic complication 13.1% in SV group, in 13.3% EJV group. The reason of high complication rate than literature, that we believe its We believe that the reason of high complication rate associated with initial learning curve and blind puncture catheterization.

One of the most frequently reported complications of ICVP insertion is arterial puncture [12]. Rush et al. [6] reported that arterial punctures were significantly most more common with in the jugular approach than with in the subclavian approach (3% versus 0.5%). We found that arterial puncture was 14 (9.7%) in SV group, 20 (12.1%) in EJV group. However bleeding can usually be undercontrolled by compression and we also stopped bleeding in all patients with this way. Catheter malposition can have serious conditions. Displacement of a subclavian catheter into the other vein or neck veins may have more severe condition than displacement of a jugular catheter into the right atrium. In the meta-analysis, Ruesch and et al [6] reported that malposition was significantly less common with the jugular vein approach (5.3% vs 9.3%). Gladwin et al [13] also reported that this higher rate (14%) was observed with the internal jugular vein. We have seen malposition only one patient who underwent jugular approach. The port infection rate in the related literature ranges from 2.6% to 9% [3,14]. There was no procedure early related infection observed. In our study, port related infection developed during following up 7 (4.8%) in SV group, 4 (2.4%) in JV group. Port removal is usually not necessary unless systemic infection. We have also removal removed four ports because of due to systemic infection. The puncture of the subclavian vein is connected associated with pneumothorax in 0.6-4.3% of patients in all the published studies [3,5,15] and some publications were no evidence of any difference in the incidence of pneumothorax [6]. We have founded found rate of pneumothorax 5 (3.4%) in SV group, 2 (1.2%) in JV group. We believe that the subclavian access is more possible to pneumothorax because of the anatomical trace. Recently, we prefer the jugular vein access because of the lower risk pneumothorax. There is an increased risk of pneumothorax in patients who have a severe emphysema, bullous lung and acute respiratory distress syndrome. 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 [14,16]. The catheter was broken in one patient and migrated to the right ventricle (0.7%). Routine device removal cannot be recommended in every patient. Port systems must be removed in case of persistent sepsis, or recurrens of infection after antibiotic treatment, signs of port or catheter tunnel infection, unstable patients, systemic complications [17]. Biffi et al. [21] were observed thrombosis in 15 cases with internal jugular access and eight cases in SV Access. The thrombosis was seen in one patient (0.7%) in our study. One of the reasons may be the when manoeuvered maneuvered around the bend at the innominate-caval junction the tip of the catheter or introducer may impair the endothelium, predisposing to mural thrombosis. Thus if tip of the catheter or introducer don’t touch to the vessel wall, may reduce risk of thrombosis. As a result, we have also removed seven ports for untreatable complications (infection in four patients, malposition of catheter in one patient, jugular vein thrombosis in one patient, obstruction of catheter in one patient). There is some evidence that there were more arterial punctures but less catheter malpositions with in the JV group compared with the SV group. Regarding this point, in literature studies were summarized in table 3 (table 3).

According to experience, our results show that central venous access insertion site does not influence early or late complication. There was no significant differences in complication rates between two groups despite a longer stay SV catheter (complication numbers 28 in SV group, 28 in JV group). A limitation of this study is that there was no randomization and however it should be noted that this study took place at a single centre experience with a limited number of cases included. So further studies are required to determine which one is to be better ways the best way for vascular access.

Competing interests

The authors declare that they have no competing interests.

Table 3. Summary of venous access device studies

Author	Year	No of devices	Infection (%)	Thrombosis (%)	Pneumothorax (%)	Removal for complication (%)	Mean catheter life (months)
Schwarz et al (19)	1997	680	8.8	3	0	14.1	39
Biffi et al (18)	1998	333	2.7	1.5	3.4	3.6	8
Kock et al (5)	1998	1500	3.2	2.5	0.3	11.9	9
Lorch et al (14)	2001	125	2.4	0	1.6	4.8	3
Vardy et al (20)	2004	111	4	2	2	7	7
Charvat et al (4)	2006	100	1	0	0	6.2	13.5(407 days)
Cil et al (16)	2006	476	1.8	0	0	3.1	12.5(376 days)
Biffi et al (21)	2009	401	1.2	8.4	0.2	0.4	596(0-1087) (median)

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