Ambulatory Surgery

Ambulatory Surgery 6 (1998) 207–210

Implant of subcutaneous central venous access devices in outpatient surgery

Francesco A. D'Angelo [a,*], Giovanni Ramacciato [a], Paolo Aurello [a], Alessandra Caramitti [a], Gaetano Lanzetta [b], Salvatore Lauro [b], Matilde Magri [a]

[a] *Istituto di I Clinical Chirurgica, Universita' degli Studi di Roma, 'La Sapienza' Policlinico Umberto I, Viale del Policlinico 155, Roma, 00161, Italy*

[b] *Istituto di Patolovia Generale, Universita' degli Studi di Roma, 'La Sapienza' Policlinico Umberto I, Viale del Policlinico 155, Roma, 00161, Italy*

Received 20 November 1997; accepted 31 January 1998

Abstract

Today, an increasing number of subcutaneous central venous access devices are implanted on a ambulatory basis either by percutaneous vein puncture or venous cut down. The aim of the present study was to prospectively evaluate which is the most suitable implant technique for ambulatory surgery by comparing subclavian vein puncture using a Seldinger technique with cephalic vein cut-down in terms of operative morbidity, patient acceptance and health costs. Analysis of a personal series of 189 subcutaneous central venous access device insertions did not show any significant difference between the two methods, with an overall morbidity of 9.6 and 6.5% (P = ns), respectively, a greater cost of $120 for percutaneous subclavian vein puncture and a slightly more painful experience during dilatation for catheter positioning during the Seldinger manoeuvre. Furthermore, subclavian vein puncture carries the risk of major complications, such as pneumothorax, major vessel injury or nerve palsy. In conclusion, we think that venous cut-down is the ideal technique for ambulatory surgery, limiting the Seldinger technique to cases where proper catheter insertion through the cephalic vein is impossible.

Keywords: Subcutaneous port; Surgical access; Ambulatory surgery

1. Introduction

Different techniques for subcutaneous central venous access device implant (SCVAD) are currently employed [1], but mainly percutaneous vascular access using the Seldinger technique or venous cut-down [1]. Morbidity of both insertion techniques is generally low and implants are currently performed by different specialists, including surgeons, anesthesiologists, radiologists and nephrologists [2]. A great number of SCVAD procedures are undertaken on an outpatient surgery basis. The aim of the present paper is to prospectively analyse a personal series of SCVAD insertions to evaluate the most suitable implant technique for outpatient surgery.

2. Materials and methods

A consecutive series of 139 subcutaneous central venous access devices implanted in the I Istituto di Clinica Chirurgica-SS Chirurgia Geriatrica of the Universita' degli Studi li Roma 'La Sapienza' has been prospectively analysed. Implants occurred between January 1992 and June 1997 in 187 patients, 103 (58%) male and 78 (42%) female (female to male ratio 1:1.3). Two patients experienced a second implant (1%). Age ranged from 19 to 79 years, median 59.6, mean 57. All the patients presented solid tumors and chemotherapy has been the main indication for implant. A total of 179 SCVAD implants occurred in outpatient surgery (95%), while ten occurred as inpatient surgery (5%) during the operation for the primary malignancy (inpatient to

* Corresponding author.

0966-6532/98/$ - see front matter
PII S0966-6532(98)00009-2

Table 1
Ambulatory implant of subcutaneous central venous access device

Access	Complications					
	n	Overall *n* (%)	Sepsis *n* (%)	Displacement *n* (%)	Thrombosis *n* (%)	Occlusion *n* (%)
Cephalic	104	7 (7.4)	1 (1.4)	3 (2.7)	3 (2.7)	0
Subclavian	60	6 (9.6)	4 (6.4)	1 (1.6)	1 (1.6)	0
Basilic	6	1 (16.6)	0	0	0	1 (16.6)
I. jugular	6	0	0	0	0	0
Saphenous	3	0	0	0	0	0
Total	179	14 (7.4)	5 (2.6)	4 (2.1)	4 (2.1)	1 (0.5)

outpatient ratio 1:18.9). As outpatient surgery, different implant techniques have been utilised: cephalic vein cut-down in 104 cases, percutaneous subclavian vein puncture with Seldinger technique in 60 cases, internal jugular vein cut-down in six, basilica vein cut-down in six and saphenous vein cut-down in three. During the surgical operation for the primary malignancy implants occurred with cephalic vein cut-down in four cases, saphenous vein out-down in three cases, percutaneous subclavian vein puncture in two cases and internal jugular vein cut-down in one case. Saphenous vein cut-down was chosen when superior vena cave catheterization was contraindicated, while basilic vein access was used when patients requested the avoidance of an unesthetic scar in the upper thoracic girdle. All the other implant techniques were utilised according to the surgeon's preference. Ambulatory surgery was performed after evaluation of cardiac performance, chest X-ray and coagulation profile. After monitoring the patients with continuous ECG and pulse oximetry, local anaesthesia was induced with a solution of bupivacaine 0.50% and 0.9% NaCI in a ratio of 1:2. A peroperative intravenous single dose of third generation cephalosporine was given except in cases of known specific allergy. Intraoperative X-ray screening was utilised in all cases to asses the correct position of the catheter. In cases of percutaneous subclavian vein puncture, a chest X-ray was taken 2 h after the implant to rule out a pneumothorax, prior to hospital discharge. Patients were advised to take nimesulide 100 mg per os the night of the operation and the next morning; clinical control was performed on the second post operative day, before allowing the use of the device.

Three different kinds of device were employed, according to hospital availability: Port-a-Cath (Pharmacia Deltec, St. Paul, MN) in 20 cases, Celsite ST 201 (B. Braun Celsa, Chasseneuil, France) in 155 cases and R-Port (Boston Scientific, MA) in four cases.

Statistical analyse has been made by the χ^2-test. $P < 0.05$ was considered significant.

3. Results

In a total of 189 subcutaneous venous access device insertions, 179 occurred in outpatient surgery (95%). There were 14 (7.4%), complications: five sepsis (2.6%), four displacements (2.1%), four venous thrombosis (2.1%), one catheter occlusion (0.5%). In individual implant techniques we recorded seven complications with cephalic vein cut-down (6.5%): one sepsis (0.9%), three displacements (2.7%), three thrombosis (2.7%): six complications with percutaneous subclavian vein puncture (9.6%): four sepsis (6.4%), one displacement (1.6%), one thrombosis (1.6%). In case of basilic vein cut-down there was a catheter occlusion as the only complication (16.6%), while we did not experience complications in cases of saphenous vein placement (with catheter in the inferior vena cava) (Table 1). Comparing the two major groups of implants, percutaneous subclavian vein puncture versus cephalic vein cut-down, morbidity presented no statistically difference values (P = ns) (9.6 versus 6.5%, respectively); operative time has been recorded in a comparative series of 20 patients, with mean value of 40 and 50 min, respectively (range 35–60 min in both series), P = ns. Patients were requested to define the operations as a slightly, medium or strongly painful experience. Patients submitted to percutaneous subclavian puncture recorded a medium painful procedure in 50% of cases (30 patients) compared to cephalic vein cut-down where 70% of cases (73 patients) described the procedure as slightly painful. None of the patients felt the procedure was strongly painful. No cases of procedure failure occurred, but in 12 cases (10%) we converted the insertion technique from cephalic vein cut-down to subclavian vein puncture because of cephalic vein abnormalities, while in one case (1.6%), unsuccessful percutaneous subclavian vein puncture required cephalic vein cut-down technique for proper catheter implant. All the catheter placements were performed under X-ray control. Only in cases of percutaneous subclavian puncture was a chest X-ray performed before hospital discharge. In our Institution, the cost of the operative room is $300 per

hour, $360 for the device and $60 for the intraoperative X-ray control, with a total of $1260 for both type of implants. In case of percutaneous puncture of the subclavian vein there is an additional cost of $120 for the chest X-ray.

4. Discussion

Subcutaneous central venous access devices are requested with increasing frequency in clinical practice [3,4] Two different techniques of catheter positioning are usually utilized, percutaneous venous puncture or venous cut-down [5]. The procedure is performed by different specialists, such as surgeons, anesthesiologist, radiologists and nephrologists [1,2] Moreover, a large number of PSVAD implants take place in outpatient surgery, essentially to reduce health costs. The prospective analysis of our series of cases shows how 95% of implants occurred in outpatient surgery. On the basis of this consideration, we looked for the implant technique giving the least complications (thus not requiring the need for hospital stay), compared patients acceptance and looked at health costs and results. In this prospective non randomized series, we have compared percutaneous subclavian vein puncture to cephalic vein cut-down technique (Table 1). Morbidity of the procedures did not show any statistical significance ($P = \text{ns}$) (9.6 versus 6.5%). However, we did not experience any case of pneumothorax after subclavian vein puncture, though in the literature it is reported in 1–3% of cases, [1,2,6,7] leading to patient hospitalization and eventually pleural drainage. Furthermore, some major complications, such as subclavian artery puncture, SVC rupture or nerve palsy are sometimes reported, all consequences of the dilatation during the Seldinger procedure for catheter implant after subclavian vein puncture [8–12]. These did not occur in our series. Analysing health costs, the two procedures took place in the same outpatient operative room, with no difference in instrument preparation, type of device or waste material. Operative time for percutaneous subclavian vein puncture was a mean of 40′ versus 50′ for cephalic vein cut-down, showing no statistical difference. Percutaneous subclavian vein puncture required a post-operative chest X-ray to rule out pneumothorax, with a slight increase of overall costs. In our Institution, this is an additional cost of $120 in case of percutaneous puncture of the subclavian vein compared to cephalic vein cut-down. The same kind of local anaesthesia has been practised and none of the patients reported a strongly painful experience. In the case of percutaneous subclavian vein puncture, 50% of cases felt the procedure was medium painful, particularly during dilation for catheter implant, against 70% of patients having a slightly painful experience with cephalic vein cut-down. Analysing the complications occurring in the two major groups, there is a relative major incidence of catheter dislodgement in the cephalic vein cut-down group (2.7 versus 1.6%, $P = \text{ns}$). Our surgical technique consists of a single cutaneous incision over the deltoid-pectoral groove to prepare the cephalic vein and insert the subcutaneous port. This could lead to an excessive tension on the device during the movement of the upper thoracic girdle that could facilitate the displacement of the catheter. On the other hand, we did not notice any breakage of the catheters as reported in the literature [13,14]. Breakage of the catheter could cause severe complications, such as drug extraxvasation or venous migration into the right side of the heart or the pulmonary circulation, and essentially occurs due to the compression of the catheter between the clavicle and the first rib when the catheter is inserted by puncture of the subclavian vein [13,14]. In three cases we implanted the catheter in the inferior vena cave through saphenous vein cut-down, while the subcutaneous pocket was prepared in the anterior thoracic region, above the X–XI costal arch and the catheter tunnelled in the subcutaneous tissue [15]. Only in a very limited number of cases did we experience any kind of complication with this technique. Furthermore, with cephalic vein cut-down the Trendelenburg position is not needed, though it is in subclavian vein puncture. This is a great advantage in dyspnoeic patients.

In conclusion, the prospective analysis of our series shows no significant difference between cephalic vein cut-down and percutaneous subclavian vein puncture for ambulatory implant of subcutaneous venous access devices, in terms of surgical complications, patient's acceptance or health costs. On the other hand, we think that cephalic vein cut-down is the best method for a safe ambulatory surgical procedure avoiding the potential risk of pnuemothorax, major vascular or nerve injury, or catheter fracture which could occur using the percutaneous subclavian vein puncture technique. On the other hand in 10% of cases of cephalic vein cut-down, placement of the catheter was unsuccessful for anatomical reasons, requiring subclavian vein puncture for proper catheter positioning during the same procedure. Therefore, this technique should also be familiar to surgeons undertaking the ambulatory implantation of subcutaneous central venous access devices.

References

[1] Nightingale CE, Norman A, Cunningham D, Young J, Webb A, Filshie J. A prospective analysis of 949 long-term central venous access catheter for ambulatory chemotherapy in patients with gastrointestinal malignancy. Eur J Cancer 1997;33:398–403.

[2] Damascelli B, Patelli G, Frigerio LF, Lanocita R, Garbagnati F, Marcchiano A, Spreafico C, Di-Tolla G, Monfardini L, Porcelli G. Placement of long-term central venous catheters in outpa-

tients: Study of 134 patients over 24.596 catheter days. AJR 1997;168:1235–9.
[3] Schwarz RE, Groeger JS, Coit DG. Subcutaneously implanted central venous access devices in cancer patients. Cancer 1997;79:1635–40.
[4] Shapiro CL. Central venous access catheters. Surg Oncol Clin Am 1995;4(3):443–51.
[5] Gorman RC, Buzby GP. Difficult access problems. Surg Gynecol Clin N Am 1995;4(3):453–72.
[6] Barrios CH, Zuke JE, Blaes B, Hirsch JD, Lyss AP. Evaluation of an implantable venous access system in a general oncology population. Oncology 1992;49:474–8.
[7] Torremade JR, Cienfuegos JA, Hernandez JL, Pardo F, Benito C, Gonzales J, Balen E, de Villa V. The complication of central venous access systems: A study of 218 patients. Eur Surg 1993;159:323–7.
[8] Sariego J, Bootorabi B, Matsumoto T, Kerstein M. Major long term complications in 1422 permanent venous access devices. Am J Surg 1993;165:249–51.
[9] Murray BH, Cohe SD, Davison P. Pericardial tamponade and death from Hickman catheter perforation. Am Surg 1996;62:994–7.
[10] Porter JM, Page R, Wood AK, Phelan D. Ventricular perforation associated with centra1 venous introducer-dilator systemic. Can J Anaesth 1997;44(3):317–20.
[11] Baldwin RT, Kieta DR, Gallagher MW. Complicated right subclavian artery pseudoaneurysm after central venipuncture. Ann Thorac Surg 1996;62:581–2.
[12] Rigg A, Hughes P, Lopez A, Filshie J, Cunningham D, Green M. Right phrenic nerve palsy as a complication of indwelling central venous catheters. Thorax 1997;52:831–3.
[13] Klotz HP, Schopke HP, Kohler A, Pestalozzi B, Largiader F. Catheter fracture: A rare complication of totally implantable subclavian venous access devices. J Surg Oncol 1996;62:222–5.
[14] Monsuez JJ, Douard MC, Martin-Bouyer Y. Catheter fragments embolization. Angiology 1997;48(2):117–20.
[15] D'Angelo FA, Ramacciato C, Aurello P, Lauro S, Caramitti A, Lalle M, Magri M. Alternative insertion sites for permanent central venous access devices. Eur J Surg Oncol (in print) 1998;23.