

Persistent Left Superior Vena Cava Discovered During Permanent Pacemaker Implantation

Amar Talib Al-Hamdi, (MRCP,U.K;FRCP,E.d.)
Tahseen Ali Al-Kinani (FICMS,med; FICMS,cario)
Amanj Abubakir Jalal Khaznadar (FICMS,med;D.M)
Dara Mohammed Shareef (CABM;FICMScardio)
Jawad Mohammed Hawas(CABM; FICMS,cardio)

ملخص البحث

ان الوريد الأجوف العلوي الأيسر المتبقي هو تغير خلقي وريدي يكتشف خلال قسطرة الوريد تحت الترقوة الأيسر لأدخال سلك ناظم القلب أو جهاز الرجة . نحن نصف حالتين للوريد الأجوف العلوي الأيسر المتبقي اكتشفا صدفه خلال زرع ناظم القلب الدائمي عندما قسطر الوريد تحت الترقوة الأيسر لأجل ادخال سلك ناظم القلب . في الحالة الأولى أجلنا العملية و استعملنا الجهة اليمنى حيث من خلال قسطرة الوريد تحت الترقوة الأيمن ادخل السلك بكل سلاسة . في الحالة الثانية نجحنا في ادخال السلك خلال الوريد الأجوف العلوي الأيسر المتبقي و دفع السلك الى البطين الأيمن وبسهولة الى مخرج البطين الأيمن حيث حصلنا على تحفيز قلبي سليم . ننصح عند اكتشاف الوريد الأجوف العلوي الأيسر المتبقي اثناء زرع ناظم القلب ان يوضع السلك من خلاله الى مخرج البطين الأيمن و لا يستدعي الذهاب الى الجهة اليمنى من اجل ادخال السلك

Introduction

Persistent left superior vena cava (PLSVC) is a rare venous anomaly which has been reported to occur in about 0.3% of the general population according to autopsy finding [1], and 0.5% of patients undergoing cardiac device implantation [2,3] . In patients with congenital heart disease it may be found in 4-11% [4, 5]. In the majority of cases (90%) of PLSVC the right SVC is present [6,7] which may be unconnected to the PLSVC, rarely the normal right SVC is absent and in this situation the PLSVC drains blood from the upper extremities and the head and neck in to the right atrium [1 ,7]. The PLSVC drains usually in to the remarkably dilated coronary sinus (CS) whether the right SVC is present or absent but reports of rare descent of the PLSVC down to the abdomen to open in to the right renal vein has been described [8],or it rarely drains in to the left atrium [9].The PLSVC as an isolated venous anomaly usually does not cause any hemodynamic disturbance and may stay undiscovered through the person's life and only found at postmortem, device implantation or at thoracotomy for cardiac or chest surgery [5]. Increasing number of transvenous pacing leads insertion through left subclavian vein puncture or cephalic vein cut down lead to discovering more cases of PLSVC which used to prevent the transvenous pacemaker implantation [10]. Due to development of facilities of permanent pacemaker lead manipulation and ability of stylizing the lead shape many reports of successful RA and RV lead implantation through the PLSVC has been reported [6,10,11,12,13, 14, 15,16,17,18].PLSVC and absent right SVC has been noticed in association with sinus node dysfunction during pacemaker insertion for sick sinus disease (SSD) [19].

We are reporting two cases of PLSVC ; one with present right SVC through which the dual chamber pacemaker leads introduced and in the other RVOT pacing easily achieved through the PLSVC /CS approach with active fixation standard RV lead.

Case 1

A 45 years old lady with structurally normal heart, presented with recurrent dizzy spells and pre syncope and found in complete heart block for which DDD pacemaker was decided. During the implantation procedure, a left subclavian vein puncture was done and the guide wire passed easily parallel to the left cardiac boarder down to the

RA , accordingly contrast medium injected into the left subclavian vein to clarify this unusual path of the guide wire , a left sided SVC seen connected to a remarkably dilated CS which opens through a very wide os in to the RA ,(Figure 1 A & B). The procedure was postponed to the next day. The following procedure was done through right sided subclavian vein puncture which showed smoothly passing guide wire through the normally present right SVC down to the RA , Figure 2A.The lead easily advanced to the right ventricular outflow tract (RVOT) which we preferred as a pacing site to the RV rather than the RV apex. The RA lead also implanted easily,(Figure 2B). The implant procedure completed uneventfully.

Case 2

A 65 years man mildly hypertensive presented with recurrent dizzy attacks and one syncope. ECG showed sinus bradycardia and his Holter monitoring revealed sinu- atrial nodal arrest for 5 seconds duration. Permanent pacemaker was decided and during the procedure PLSVC was discovered , Figure 3A .The pacing lead was introduced through the PLSVC down to the RA and then the lead sty let curved to cross the tricuspid valve to approach the RVOT which was easily achieved and RV pacing with accepted pacing threshold and R sense was established. Figure 3 B, but unfortunately a stable RA lead position could not be obtained so a VVI pacing done.

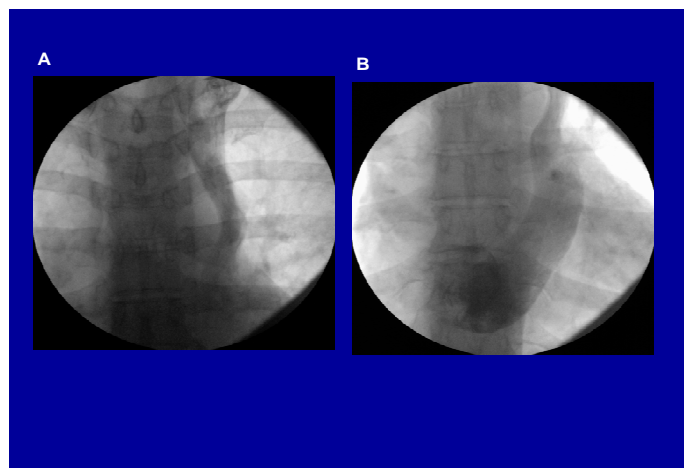


Figure 1,Cas

ed to the dilated

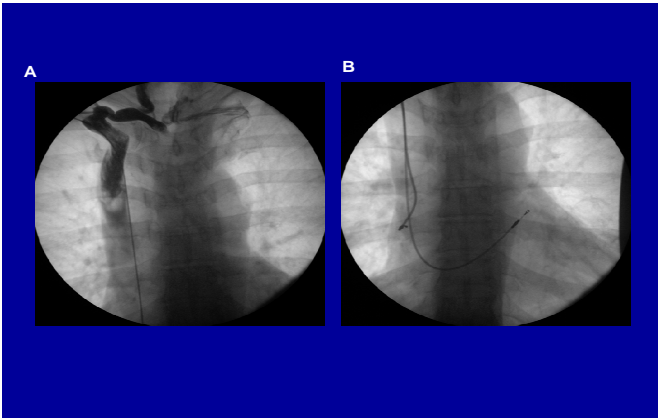


Figure 2,Case LPSVC with
pacing guide wire in. B, Dual chamber pacing , RVOT is the pacing site for the RV

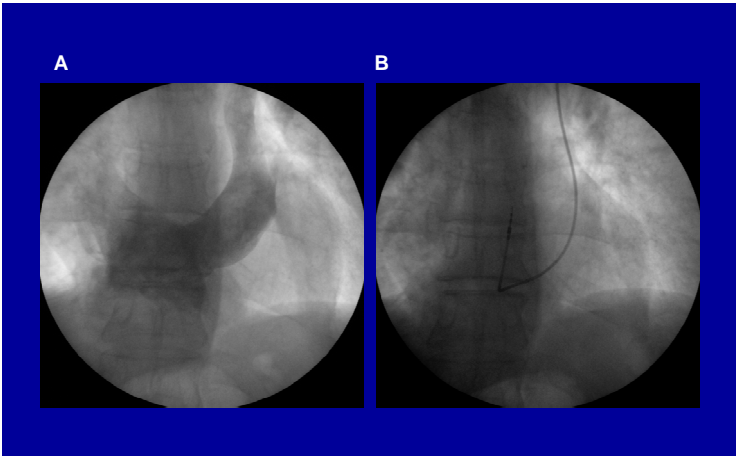


Figure 3,Case
pacing, the lead introduced through the LPSVC to the RVOT to the RVOT.

Discussion

Persistent left SVC is a rare venous anomaly but stays undiscovered because it causes no significant hemodynamic effects specially if it is not associated with other congenital heart diseases [7]. It is occasionally seen during subclavian vein puncture for central venous catheterization [20], endocardial temporary or permanent pacing lead introduction [10,11,12,13,14 and 15] or during open heart surgery and cardiopulmonary bypass[21].Detailed suprasternalechocardiography may identify this rare combined congenital defect ,hence prevent future complications during invasive procedure [3].

During cardiac device implantation the incidental finding of PLSVC may complicate the procedure and postponed it [7] ,but with a better understanding of this venous anomaly and the ability to stylizing the device leads it becomes possible to continue the implantation through the PLSVC without a need to go to the right side [10,11,12,13].The RV apical position was thought to be the most stable position and been done in the majority of PLSVC cases [11,12,13,14] . RVOT position has been found to be quite satisfactory in few reports [22,23].

In case one the PLSVC discovered when the guide wire seen parallel to the left cardiac boarder entering the RA through the CS ,because of our first experience with such venous anomaly the right sided subclavian puncture tried and with the presence of the right SVC ,the permanent pacemaker leads introduced normally. With the second case we successfully introduced the RV lead to the RVOT through the PLSVC and the CS down to the RA and then to the RVOT .The procedure was easy and smooth by curving the stylet of the lead and manipulating the lead to cross the tricuspid valve and then pushed up to the RVOT. This maneuver can be applied when PLSVC is found during permanent pacemaker lead introduction whether the right SVC is present or absent and there is no need to go through the right side .This technique can be applied to all cardiac devices including ICD leads . Several similar trials were reported in literature [8,24,7], but in these reports the RV lead was positioned at the apex and not at the RVOT as we did with the second case. In our case and few others like C. Siliste and A. Kapetanopoulos ,RVOT pacing was possible [22,23].

Conclusion

These two cases highlighted that PLSVC can be incidentally discovered during permanent pacemaker implantation and it does not prevent lead introduction.

We think RVOT pacing can be easily and smoothly achieved through the PLSVC when this venous anomaly discovered during cardiac device implantation procedures.

Acknowledgements

The authors do not report any conflict of interest regarding this work.

References

- 1.Geissler W, Albert M. Peristierende linke ober hohlvene und mitralstenose. Inn med 1956;11:865.
- 2.Mauro B,,Giuseppe B, Angelo B. left superior vena cava persistence in patients undergoing pacemaker or cardioverter-defibrillator implantation. Chest 2001;120:139-144.
- 3.Attile P, Edit N, Tamas F, Zita M, Endre N, Albert VA .Case of absent right and persistent left superior vena cava. Cardiovascular Ultrasound 2006;4:6: ...
- 4.Wood PH: Diseases of heart and circulation,2nd edition.Philadelphia: JB Lippincott;1956:457 .
- 5.Campbell M, Deuchar DC .The left sided superior vena cava .Br Heart J 1954;16:423.
- 6.Zerbe F, Bormakowski J, Sarnowski W. Pacemaker electrode implantation in patients with persistent left superior vena cava.Br Heart J 1992;67:65-66.

- 7.Rusk RA, Bexton RS, McComb , JM. Persistent left sided and absent right sided superior vena cava complicating permanent pacemaker insertion. *Heart* 1996;75:413.
- 8.Umashanker L, Edward G, Abrar H Shah. Permanent pacemaker implantation via left superior vena cava without communication with the coronary sinus. *J Interv Card Electrophysiol* (2003)25:219-221.
- 9.Meadows WR, Sharp JT. Persistent left superior vena cava draining in to the left atrium without arterial oxygen unsaturation. *Am J cardiol* 1965;16:273-279.
10. Harthborne JW, Dismore RE, Desanctis RW. Superior vena cava anomaly preventing per venous pacemaker implantation.*Br heart J* 1969;31:809-810.
- 11.AL- Saeq A, AL-Kandary F. Successful implantation of a permanent pacemaker through persistent left superior vena cava. *Med Princ Pract* 2002;11:53-55.
- 12.Gambhir DS, Verma PK, Agarwala R, Kaul UA, Arora R. Transvenous right ventricular pacing through coronary sinus in the absence of right superior vena cava. *Indian Heart J* 1996;48:401-402.
- 13.Birnie D, Tang AS. Permanent pacing from a left ventricular vein in a patient with persistent left and absent right superior vena cava .*Pacing Clin Electrophysiol* 2000;23:2135-2137.
- 14.Hanna –Mousa S, Jhonson V, Raina A. Implantation of a dual chamber pacemaker in a patient with persistent left superior vena cava using a steerable stylet. *J invasive cardiol* 2002;14:192-193.
- 15.Dora KS, Tharakan JM, Kumar A. Right ventricular pacing via left vena cava. *Indian Heart J* 2004;56:150-151.
- 16.Lappeg A,Knut T, Prytz J, Haug B. Pacemaker implantation in patients with persistent left superior vena cava. *Heart and Vessels* 2004;19(3):153-154.
- 17.Faval S, Bardy GH, Pitzalis MV, Dicandia CD, Traversa M, Rizzon P. Transvenous defibrillator implantation in patients with left superior vena cava and right superior vena cava atresia. *European Heart Journal* 1995 16(5):704-707.
- 18.Deepak G, Prem K, Reginald T H, Behzad P, Arnold J G .Permanent pacing from a left ventricular vein in a patient with persistent left superior vena cava and absent right superior vena cava: use of an over-the –wire system. *J of Interv Card Electrophysiology* 2003;9:357-390.
- 19.Camm AJ, Dyamond D, Spurrell RA. Sinus node dysfunction associated with absence of right superior vena cava .*Br Heart J* 1979;41:504-507.
- 20.Ruben J A, Punam N, Daniel T, Alan L, A Murat K. Persistent left superior vena cava identified after cannulation of the right subclavian vein. *Anesth Analg* 2002;95:305-307.
- 21.Bartram U, Van Paraagh S, Levine JC. Absent right superior vena cava in viscera atrial sinus node solitus. *Am J Cardiol* 1997;80:175-183.
- 22.Calin S, Dragos V, Andrei D M, Mircea C. Right ventricular outflow tract implantation of active fixation defibrillator lead through a persistent left superior vena cava. *Europace* 2008;doi:10-1093/eun 280.
- 23.KapetanopoulosA, Peckham G, Keirnan F, Clyne C, Christopher KJ, Migeed M A. Implantation of a biventricular pacing and defibrillator device via persistent left superior vena cava. *J of cardiovascular Med* 2006;7(6):430-433.
- 24.Jujjuru S ,Raja S V, Santhosh S, Rajapan A, Jayaraman B. Transvenous permanent pacemaker implantation through persistent left superior vena cava. *Indian heart J* 2004;56:346-348.