Right Internal Mammary Catheter Insertion: A Rare Complication of Rt Subclavian Vein Catheterization

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Abstract

This is the report of the insertion of a central venous catheter into the Rt internal mammary artery in lieu ofthe Rt subclavian vein by mistake in a 19-year-old patient scheduled for the correction of Tetralogy of Fallot***(Iranian Heart Journal 2011; 12 (4):66-70*)**.

Keywords: Central venous catheterization■Internal mammary artery■ Complication of CV line insertion

Anesthesiologists usually use invasive hemodynamic monitoring in major surgeries such as cardiovascular surgery, cardiac, and great vessels. Intra-arterial, central venous (CV) and intra pulmonary catheters are the monitoring devices used frequently. Monitoring of cardiac filling pressures, fluid management, and also infusion of vasoactive drugs are the basic indications for inserting central venous catheter. Because of its fewer thrombotic and infective complications compared with the femoral insertion, anesthesiologists prefer the right subclavian vein route. Iatrogenic trauma to the internal mammary artery is very rare but could be fatal.

Case report

This is the case a 19-year-old male with Tetralogy of Fallot (TOF), in whom the CV catheter was introduced into the right internal mammary artery by mistake. The right subclavian artery was shunted to the ipsilateral pulmonary artery.

Echocardiography findings were TOF anatomy (large ventricular septal defect, severe valvular pulmonary stenosis, overriding of aorta on both ventricles, and right ventricular hypertrophy) and also right-MBT(Modified Blalock-Tossing) shunt.

Heart catheterization was done via the right femoral vein, and the following data from anteroposterior and lateral views were obtained:

- Severe valvular pulmonary stenosis + post stenotic dilatation
- Large ventricular septal defect (VSD)
- Overriding of aorta on both ventricles
- Adequate size of pulmonary artery branches.

- LV catheterization in LAO view showed large VSD +N.C.A and adequate LV size.
- Slightly RT-MBT shunt and LT aortic arch and no AI

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Table I

Hematology	
WBC	6100 mm^3
RBC	$6.2 * 10^6 mm^3$
HB	21 mg/dl
Hct	60.5%
MCV	96.6 fl
MCH	33.9 Picgm
MCHC	34.6 g/dl
Platelet	$210 * 10^3 mm^3$

Blood biochemistry	
FBS	103 mg/dl
BUN	25 mg/dl
Cr	1.19 mg/dl
Mg	2.5 mg/dl
Na	143 mg/dl
K	4 mg/dl
Ca	9.6 mg/dl
phosphor	4.6 mg/dl
AST	24 IU
ALT	21 IU

Laboratory test results are collected in Tables 2, 3, and 4.

Anesthesia

The patient was given 1 mg of Lorazepam orally on the night before surgery (at 20 pm) and also one hour before the operation.

In the operating room, the patient was placed under monitoring with the ECG (II, V5), pulse oxymetry ,and BIS (Space Labs Medical model no 90491).Then, two peripheral venous accesses were taken from the patient's hands. A catheter (no: C arrow Ref SAC 20 00829) was inserted into the left radial artery to continue invasive blood pressure monitoring. First blood gas analysis in the room air revealed PH=7.35 pao2=68 , paco2=37,o2sat =92% , and Hco3=18.

We used a multi-lumen catheter (B-Braun 7F×8"(20cm), 16G-16G Melsungen AG Germany) for central venous pressure

Coagulation	
PTT	36 sec
PT	15.8 sec
Activity	94%
INR	1.56
BT	1 min
CT	5.3 min

Cath. Data from	Oxymetry	Pressure mmHg
SVC	68%	a=12
RA	62%	V=46
RV	74%	120/0-12
PA	60%	14/8-10
AO	84%	125/75-85
LV	90%	120/0-8

monitoring . After skin disinfection and local anesthesia , according to the anatomical landmarks, the needle was introduced into the right subclavian vein by first attempt, and very dark blood was aspirated. The catheter was introduced by the Seledinger technique and was attached to the monitoring system. The mean CV pressure was 30_38mmHg initially; this high pressure was appreciable because of the TOF anatomy, and with the presence of VSD.

After 700 ml normal saline infusion and 3-minute pre oxygenation, the patient was anesthetized with Fentanyl 10mic gr/kg and Midazolam 0.1mg/kg. Thereafter, tracheal intubation was done by Atracurium 0.5 mg/kg. Anesthesia was maintained with Fentanyl 2 micgr/kg/h , Propofol 50micgr/kg/min, and Atracurium 0.6 mg/kg/h in addition to oxygen 100%. Propofol was administered through the CV line. Following the correction of the TOF and separation from cardiopulmonary bypass pump, the blood pressure was 100/65 mmHg and the CVP was

40 mmHg. Because of the high CV pressure and also the curve shape, which was similar to the arterial curve, the investigator assumed that the CV catheter was in an artery.
To make sure whether the position of the CV catheter was right or not, two samples of blood from the CV line and radial artery were sent for ABG analysis simultaneously. The results, shown in Table 5, were similar.

Table No 5

ABG		
Data	Arterial line	CV line
PH	7.42	7.41
$PaCO_2$	36.5 mmHg	30.5mmHg
PaO_2	557 mmHg	549 mmHg
SaO_2	100%	100%
BE	-2.8 mmol/l	- 2.9 mmol/l
H_2CO_3	17 mmol/l	17 mmol/l

When it was suspected that the catheter was in the artery, the anesthesiologist clamped it and another catheter was inserted into the right femoral vein.
To verify that the subclavian CV catheter was in an artery, an X-ray following an omnipaque injection-a radiopaque solution-was taken (Figure 1B). The radiograph revealed that the catheter was in the right internal mammary artery. Because of bleeding problems, fresh frozen plasma (FFP) and platelets were given. The previous catheter was removed the next day. Control radiograph for evidence of bleeding, which proved negative for three days consequently, helped us to transfer the patient to the cardiac ward from the ICU. The control chest radiogram following the removal of the catheter is shown in Figure 2.

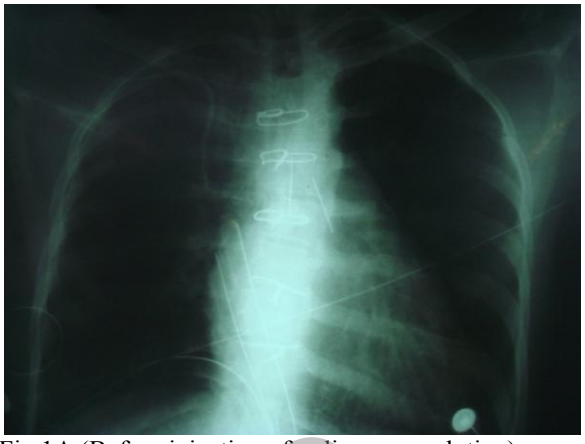
Fig.1A (Before injection of radiopaque solution)

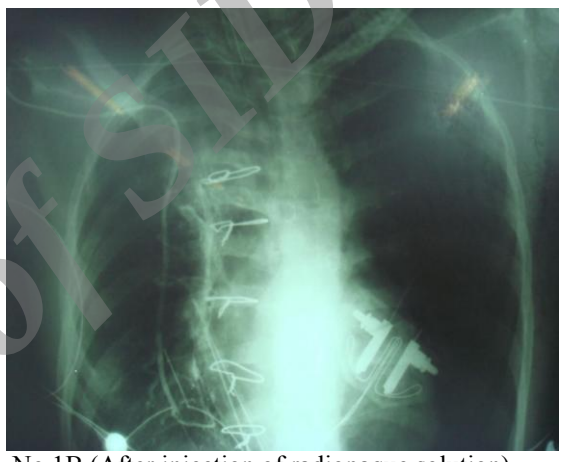
Fig. No.1B (After injection of radiopaque solution)

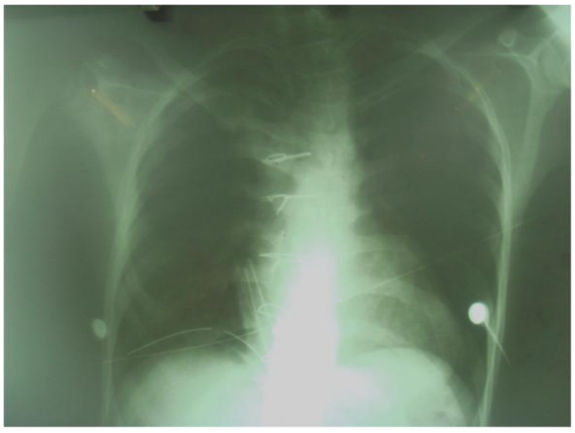
Fig. no.2

Discussion

Cannulation of the subclavian vein may cause many problems, including penetration of the artery in 6-8% of cases.[4] Nevertheless, in children it may rise to up to 10%[5] due to the puncturing of the subclavian artery, pulmonary artery, and neighboring artery such as internal mammary and intercostal arteries with bleeding consequences.[6]These arteries, giventheir anatomical position, are not compressible for stopping the bleeding, which means that the local pressure has no effect.[7] Fortunately for the patient presented herein, we did not encounter such difficulties,according to the radiological test.

Formation of pseudoaneurysm in the subclavian, intercostal, and internal mammary arteries, which have been reported following cannulation of the subclavian vein, is one of complications of this procedure.[8, 9] The other problem may be mediastinitis in children due to damage to the internal mammary artery.[10]Here again in this case, pseudoaneurysm was not observed.

Poble G.Ealmeshianand and co- workers reported two iatrogenic cases of damage to the internal mammary artery. The first patient was a 3-year-old girl, whoseblood pressure following internal jugular vein cannulation had dropped severely. Selective angiography revealed damage to the internal mammary artery but eventually ended with death of the patient following cardiac arrest.

The second patient was a 7–year-old girl, in whom after right subclavian vein cannulation, severe hypotension and shock were encountered. Damage to the internal mammary artery by using selective angiography was recognized immediately. The patient was treated by embolization and he is alive now.[3]

Our patient had no hypotension or any other serious hemodynamic problem following internal mammary cannulation.

Hemothorax as a rare case and it has been reported as a result of removing the central vein catheter.[11] Some authors believe that monitoring is essential after the catheter has been removed in order to prevent any morbidity and mortality.[12]

Three chest X-rayson three consecutive days (one each day) were obtained from our patient. Fortunately, there was no report of any hemothorax after the removal of the catheter.

From previous studies, no major changes in the hemodynamic parameters following the injection of Propofol into an artery have been reported. However, severe pain may be felt, which maycausetachycardia.[13]Fortunately, our patient did not experience such pain because he was under general anesthesia; therefore, an increase in the heart rate was not expected.

Two laboratory studies[14,15] have shown that Propofol has no effect on vascular myogenic activity.Indeed, no noxious effect on the vascular wall has been found yet. In our case, Propofol was injected from the central vein catheter for 65 minutes; and since it was located in the mammary artery, no disorganization in hemodynamic or secondary vascular difficulties occurred.

It must be emphasized that mechanical problems of central vein catheterization may be fatal and this is considerable in children and in patients with severe congenital disorders.

When a central venous catheter is introduced without image guiding, a routine procedure for the verification of the exact position of the cannula and the depth of it and can be assisted by blood color-dark or light-or unreliable anatomical landmark, such a complication must be expected.[16]

In light our findings, we would recommend that sonography-guided insertion be used to prevent any complication, especially in children and those with congenital disorders while a central venous catheter is being introduced.

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