SVC Duplication: The case of the erroneous catheter tip

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Abstract

In most individuals with normal anatomy, the SVC lies to the right of the heart and drains into the right atrium. SVC duplication is one of several possible explanations if a central venous catheter tip is found to the left of the heart. It is thought to occur in around 0.1% of the general population and in 10% of those with congenital heart disease. It is a mostly benign condition. Our case involved a 73-year-old lady who was admitted to our critical care department for vasopressor support following an acetabular ORIF. Her left internal jugular vein was cannulated with a 16cm quadrilumen CVC using an USS-guided, seldinger technique. A routine post-insertion chest x-ray demonstrated the line to follow a course to the left of the cardiac shadow with the tip along the left margin. Due to the unusual location and the uncertainty as to whether this line was safe to use, the case was discussed with the on-call radiologist who recommended a CT thorax to confirm the line position. This scan showed SVC duplication, with the CVC tip lying within a left-sided SVC terminating in the heart (likely the left-atrium). There was no dextrocardia or situs inversus. Whilst rare, this case highlights the importance of chest imaging following CVC insertion. In terms of the safety in using such a catheter, that should be determined by the drugs being infused, the possible locations and abnormalities presented by such a position and whether there are any other suspected complications as a result of insertion. This should be determined on a case-by-case basis.

Keywords: SVC duplication, central venous catheter position, central line.

Introduction

A 73-year-old woman was admitted to our critical care unit following a right-sided open reduction internal fixation of her acetabulum. Her past medical history included a total hip replacement 13 years previously (on the same side), atrial fibrillation, charcot-marie-tooth, hypertension, hypothyroidism and mitral regurgitation. She was hypotensive in recovery due to a combination of epidural-related vasodilatation, residual anaesthetic, under-filling and sepsis. A peripheral metaraminol infusion was started and she was referred to critical care for ongoing blood pressure support. With escalating requirements, insertion of a central line was considered to facilitate administration of noradrenaline. No obvious right internal jugular vein was seen on ultrasound scan and therefore the left internal jugular vein was cannulated using a seldinger technique with no recorded difficulty. A routine post-insertion chest x-ray was done to check line tip position and rule out complications. This demonstrated the line to follow a course to the left of the cardiac shadow with the tip along the left margin. Due to the unusual location and the uncertainty as to whether this line was safe to use, the case was discussed with the on-call radiologist who recommended a CT thorax to confirm the line position.

This plain CT thorax (no contrast) scan was reported as “The scan confirms that the central venous catheter is intraluminal and within the left superior vena cava which is a normal variant of anatomy. Its tip lies within the heart, the exact site is uncertain. There is an absent left innominate vein. The confluence of the left internal jugular vein and the left subclavian vein continue as a left-sided superior vena cava and most likely drains into the coronary sinus of the left atrium. No other vascular anomalies. No dextrocardia or situs inversus.”

Discussion

Even though a post-insertion chest x-ray may not be necessary following uncomplicated central line insertion[1-3] and despite the potential inaccuracy of the tip position due to parallax error,
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proposed for SVC duplication including
evident. Various classifications have been
therefore an abnormality would not be
commonly placed on this side and
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are often missed due to the co-existence of
the left atrium[11], as is this case. They
right-sided SVC, with 8% draining into
Eighty two percent occur with a normal
population[4-6], or 2-11% of those with
other congenital heart disease[7-10].
This is thought to be present in
approximately 0.1-0.5% of the general
population[4-6], or 2-11% of those with
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Eighty two percent occur with a normal
right-sided SVC, with 8% draining into
the left atrium[11], as is this case. They
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a right-sided SVC, with CVCs most
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therefore an abnormality would not be
evident. Various classifications have been
proposed for SVC duplication including
on the basis of the presence/absence of an
anastomosis between the left and right
SVCs12 or on type13:
1. An anastomotic branch between the left and right
2. No anastomotic branch
3. L alone with degeneration and disappearance of the right
4. Double SVC with paired azygous
Despite a duplicate SVC usually being a
benign anatomical abnormality, there is
some clinical significance to their
existence:
1. The patient is more likely to have co-
existing cardiac abnormalities
2. There may be a right to left shunt if the
duplicate drains into the left heart
3. There may be difficulties in cardiac
catheterisation[14-15]
The coexistence of a duplicate SVC and
shunt is high[1]. In our case the exact
course and drainage of this duplicate was
unclear as the CT performed was non-
contrasted. The exact drainage of this
vessel remains uncertain but is most likely
to be into the coronary sinus. In cases of
known SVC duplication, extra care should
be taken to avoid placement of guidewires
or catheters near the coronary sinus as this
is particularly arrhythmogenic[16]. If
indeed it did open into the left atrium, it
would have formed a shunt between the
left and right atrial systems, although
there was no obvious clinical significance.
Usually the ideal catheter tip placement is
accepted as being in the largest possible
vein (but outside the pericardial sac) and
parallel with the long axis of the vein to
prevent it abutting the vein wall[11]. The
importance of whether this is achieved
depends very much on its intended use.
For example, CVP or mixed venous
saturation measurement would require
different positions compared to extra-
corporeal circuits or those to be
used for vaso-
toxic drugs.
Regardless of
the actual drainage of our duplicate SVC, it
was clear the catheter tip was sitting in a
large vein. As we anticipated only low
dose noradrenaline being required for a
short period of time, we deemed it
appropriate to use the line. As the
presence of a shunt predisposes to
systemic air or particulate emboli on
catheter usage we warned the nursing staff
to be particularly cautious when aspirating
and flushing the line. Although Charcot-
Marie-Tooth (CMT) can cause a variety
of motor and sensory neuropathies, there
is no evidence linking this condition with
vascular anatomical anomalies. The co-
existence of a duplicate SVC and her
CMT is probably a coincidence.
Cardiovascular abnormalities such as
dilated cardiomyopathy and conduction
disturbances have been linked with
CMT[17].

Recommendations
The authors recommend that any
abnormal or unexpected central venous
catheter position be discussed with a
radiologist to ascertain the need for
vascular imaging. In terms of the safety in
using such a catheter, that should be
determined by the drugs being infused,
the possible locations and abnormalities
presented by such a position and whether
there are any other suspected
complications as a result of insertion.
This should be determined on a case-by-case
basis.
References


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