

# The Consequences of Negligence Claims in Arterial Surgery – An Analysis of Two Periods with an Increasing Use of Endovascular Treatment

David Bergqvist <sup>a,\*</sup>, Larsolof Hafström <sup>b</sup>, Pelle Gustafson <sup>c</sup>

<sup>a</sup> Department of Surgical Sciences, Academic Hospital, Uppsala University, Uppsala, Sweden

<sup>b</sup> Department of Surgery, Sahlgrenska Academy, Gothenburg University, Gothenburg, Sweden

<sup>c</sup> Swedish National Insurance Company, Stockholm, Sweden

## WHAT THIS PAPER ADDS

This is a unique study on negligence claims in vascular surgery in Sweden with a unique legal system to deal with such problems. Although the proportion of endovascular surgery has increased between the two periods, the relative number of claims has remained stable. However, fewer claims lead to financial compensation.

**Objectives:** Patient treatment within the Swedish medical service system can claim negligence injuries to the malpractice insurance review board and request financial compensation. The aim of this paper was to analyse the consequences of a negligence claim after arterial surgery between two periods with increasing use of endovascular treatment.

**Methods:** This was a retrospective cohort study of the arterial surgery negligence claims from two three year periods 2005–2007 (Period A) and 2012–2014 (Period B) from the County Council's Mutual Insurance Company. The analysis was restricted to aortic, carotid, and lower limb arterial diseases. The magnitude of surgery for vascular diseases was obtained from the Swedish vascular register (Swedvasc).

**Results:** The number of patients undergoing arterial procedures increased from 16 628 to 20 709 ( $p = .01$ ). There was an increase of 54% in the number of negligence claims between the periods. In Period A, the number of compensated claims was 22 out of 83 (29%) and in Period B 60 out of 151 (41%) ( $p = .06$ ). Patients treated for aortic disorders and peripheral arterial surgery received compensation with increasing frequency whereas carotid diseases decreased. Claimants treated for aortic disorders were compensated in four out of 23 (17%) and 21 out of 54 (39%) in the two periods ( $p = .07$ ), and after lower limb arterial surgery in six out of 34 (18%) and in 24 out of 71 (34%) ( $p = .09$ ). After carotid surgery the corresponding figures were 12 out of 26 (46%) and 14 out of 25 (46%) ( $p = .48$ ). The increasing use of endovascular procedures (but not in carotid artery surgery) did not seem to influence the pattern of negligence claims.

**Conclusions:** Between the two three year periods there has been an increase in negligence claims but not in compensated ones. The increased use of endovascular procedures has not influenced the pattern of compensated negligence claims.

**Keywords:** Arterial surgery, Aortic surgery, Carotid surgery, Malpractice claims, Peripheral arterial surgery

Article history: Received 17 October 2018, Accepted 21 June 2019, Available online 14 September 2019

© 2019 Published by Elsevier B.V. on behalf of European Society for Vascular Surgery.

## INTRODUCTION

There is great variation in the magnitude of adverse events in all forms of medical care. Some patient injuries occur as a result of unavoidable complications, which must be considered as a calculated risk of a necessary treatment. Some of the injuries, however, are avoidable. In surgical

care in Sweden almost two thirds of undesired events named “patient injury” are regarded as “probably preventable” or “preventable”.<sup>1</sup> The definition of an avoidable injury according to Swedish law is that if the injury occurred despite the care being given in accordance with good professional norms and modern standards, it is considered unavoidable, otherwise preventable or probably preventable. If the injury is considered to be avoidable, the patient is entitled to compensation.

The main principle for invasive treatment of arterial disease has been open surgery. In the mid 1970s percutaneous transluminal angioplasty (PTA) was introduced, and

\* Corresponding author. Department of Surgical Sciences, Academic Hospital, SE-75185 Uppsala, Sweden.

E-mail address: [david.bergqvist@surgsci.uu.se](mailto:david.bergqvist@surgsci.uu.se) (David Bergqvist).

1078-5884/© 2019 Published by Elsevier B.V. on behalf of European Society for Vascular Surgery.

<https://doi.org/10.1016/j.ejvs.2019.06.030>

thereafter various endovascular methods have developed rapidly. Today more than half of the surgical treatments are performed endovascularly, except for carotid artery disease where the majority are still treated by open surgery. The consequences of this strategic shift have contributed to a change in the panorama of complications and patient injuries and therefore also negligence claims. The claims during the first years of the 2000s have previously been analysed: 193 claims after vascular surgery were identified, 55 of which received financial compensation.<sup>2</sup>

The Swedish national registry for vascular surgery (Swedvasc) has covered the whole country since 1994. It is a web based data protocol including diagnosis, type of surgery, risk factors, complications, and outcome after 30 days and one year. The register has been found to be highly accurate on international validation, with 96% agreement compared with official health statistics.<sup>3</sup>

The aim of this article was to analyse the pattern of patient injury claims for arterial surgery (aortic, carotid and lower limb surgery) in the two periods: 2005–2007, when endovascular surgery was used increasingly, and 2012–2014, when the development and use of endovascular surgery had stabilised. The study analysed whether there was a change in the pattern of injuries as judged by claims to Landstingens Ömsesidiga Försäkringsbolag (LÖF) (the county council's mutual insurance company) between these two periods, and if the claims were settled (that is financially compensated because of avoidability).

## MATERIAL AND METHODS

In Sweden, since 1975 there has been a legally mandated national insurance system for financially compensating losses due to healthcare injuries. Patients treated within the Swedish medical service system and financed by the county medical councils (Landstinget in Swedish) can file negligence claims to LÖF, a mutual insurance company, and request financial compensation. LÖF processes more than 90% of all patient injury claims in Sweden; in 2017 more than 16 000 claims were recorded.

The criteria for being avoidable is if an experienced specialist in the same field of practice could have chosen another treatment or procedure or performed the procedure in some other way, and by doing so avoid the injury, but still meet the medical needs of the patient. This assessment is made by selected doctors in the medical field in which the claimed injury occurred.

This analysis is a retrospective cohort study from two three year periods of negligence claims after arterial surgery, both open and endovascular. All settled claims to LÖF following arterial procedures performed in 2005–2007 (Period A,  $n = 99$ ) and 2012–2014 (Period B,  $n = 169$ ) were included (Table 1). Owing to the small number of events the following procedures were excluded from the analysis (renal artery, two; temporal artery, one; coronary artery, five; carotid body tumour, one; arteriovenous fistulas, 15).

“Settled claim” is used here for a claim that when judged against the insurance terms was deemed avoidable and

**Table 1.** The number of negligence claims for arterial injuries to LÖF in Period A 2005–2007 and Period B 2012–2015

Related procedure	Period A ( $n = 99$ )	Period B ( $n = 169$ )
Aorto-iliac arteries	23	54
Renal artery	2	
Carotid artery	26	25
Coronary arteries	3	3
AV fistula	6	9
Lower limb arteries	34	72
Temporal artery	0	1
Carotid body tumour	1	0

AV = arteriovenous; LÖF = Landstingens Ömsesidiga Försäkringsbolag (the county council's mutual insurance company)

thus resulted in compensation. An unavoidable complication or calculated risk had to be accepted by the sufferer.

According to Swedvasc there were about 7200 aorto-iliac repairs, 23 000 peripheral arterial procedures, and 6000 interventions for carotid artery disease registered during the study periods (Table 2). Data on yearly operation numbers have been collected from the official yearly report from Swedvasc.

StatView software version 6.0 (SAS Institute, Cary, NC, USA) was used for statistical calculations. Statistical significance was set at a  $p$  value  $< 0.05$ .

The study was approved by the Regional Ethics Committee of Uppsala University (Act 2018/015). All claimants have given their written permission for their actions to be used for research purposes.

## RESULTS

In Period A (2005–2007) there were in total 28 964 negligence claims to LÖF and in Period B (2012–2014) 41 531, an increase of 44% ( $p < .001$ ). The fraction of settled claims decreased from 44% to 40% ( $p = .004$ ).

The number of individuals undergoing arterial procedures (aorta, carotid, and lower limb arteries) registered in Swedvasc increased from 16 628 to 20 709 (18%) ( $p = .01$ ) (Table 2).

**Table 2.** Number of surgical procedures per year according to the Swedvasc registry

Year	Aortic aneurysm		Carotid surgery		Lower limb surgery	
	Open	Endo	Open	Endo	Open	Endo
2005–07	2243	1144	3934	159	4475	5574
2005	772	325 (29.6)	960	43 (4.4)	1619	2088 (56.3)
2006	741	391 (34.5)	1956	54 (4.9)	1576	1706 (51.9)
2007	730	428 (37.0)	1018	62 (5.7)	1280	1780 (58.0)
2012–14	1791	2069	2918	151	4430	9410
2012	673	673 (50.0)	1013	56 (5.2)	1562	2878 (64.8)
2013	564	707 (55.6)	993	56 (5.3)	1619	3137 (66.0)
2014	554	689 (55.4)	912	39 (4.1)	1249	3395 (73.1)

There was a greater use of endovascular procedures for aortic surgery in Period B (2069 of total 3 860, 54%) than in Period A (1144 of total 3 387, 34%) ( $p = .02$ ). In Period B there were 9410/13 840 (68%) lower limb arterial procedures and in Period A 5574/10 049 (55%) ( $p = .03$ ) (Table 2).

In Period A, the total number of compensated claims was 22 out of 83 (27%) and in Period B 59 out of 150 (39%) ( $p = .06$ ).

In Period A, the number of claims for negligence in arterial vascular surgery was 83 and in Period B 150 ( $p = .07$ ). The ratio of claims to the total number of vascular procedures decreased from 0.50% to 0.28%; the proportion of procedures causing claims decreased to 44% ( $p = .02$ ).

Claimants treated for aortic disorders were compensated in four out of 23 (17%) and 21 out of 54 (39%) in the two periods, in Periods A and B respectively, and after lower limb arterial surgery in six out of 34 (18%) vs. 24 out of 71 (34%) ( $p = .09$ ) (Tables 3 and 4). Carotid surgery claimants received compensation in 12 out 26 (46%) and 14 out 25 (46%) ( $p = .48$ ) claims.

Claims after endovascular aneurysm repair (EVAR) procedures were five out of 23 (22%) in Period A and 21 out of 54 (39%) in Period B ( $p = .18$ ) and for lower limb arterial surgery in Period A seven out of 34 (20%) and Period B 16 out of 71 (23%) ( $p = .17$ ). There were no claims for endovascular carotid interventions.

The increasing number of endovascular procedures in aortic and lower limb diseases did not seem to influence the pattern of negligence claims.

In the Swedvasc registry there was a significant increase in endovascular procedures for aortic aneurysm between the two periods from 34% (1144 of 3387 procedures) to 54% (2069 of 3860), a relative increase of 59% ( $p = .04$ ). At the same time the crude number of claims for aortic procedures increased from 23 to 55 (139%) ( $p = .03$ ) (Table 3).

Claims for treatment of aortic disorders were compensated in Period A in 17% (4/23), which was less than in Period B with 40% compensated (22/55) ( $p = .04$ ). In Period A, eight out of 23 (35%) claims were related to endovascular procedures and in Period B 22 out of 55 (38%) ( $p = .42$ ).

In Period A 83% (19/23) and in Period B 60% (33/55) of the claims after treatment for aortic diseases were not accepted as negligent as these adverse events were considered to be non-avoidable complications (Table 3), a relative increase in compensated claims of 135%.

In Period A, five out of 23 claims (19%) for aortic disease occurred after endovascular repair, none being compensated for, and in Period B the corresponding frequency was 21 out of 55 (35%) (Table 3). In five of the endovascular procedures in Period B, the claims were settled. In Period B, a total of five out of 2069 endovascular procedures (0.24%) resulted in a settled claim vs. four of 1791 open procedures (0.22%).

There was a relative decrease in carotid artery surgery from 19.2 to 14.8 of the registrations in Swedvasc (Table 2) and also a relative decrease in negligence claims to LÖF between the two periods from 26% to 14% of the total

**Table 3. Claimants undergoing aortic surgery in Period A (2005–2007) and Period B (2012–2014)**

Claimants	Period A (n = 23)	Period B (n = 55)
Male/female	16/7	49/6
Median age of male/female – y	67/65	71/70
University hospital	8	30
<i>Claimed injuries in EVAR</i>	5	21
Spinal cord injury	1	1
Renal insufficiency	0	5
Neurological injury	2	7
Bleeding	1	3
Wound infection	0	2
Other	1	1
Compensated	0	5
<i>Claimed injuries in open surgery</i>	18	34
Spinal cord injury	3	3
Burn injury	2	3
Renal insufficiency	1	0
Neurological injury	2	2
Bleeding	0	5
Wound infection	0	1
Sexual dysfunction	1	2
Intestinal injury	2	5
Other	7	3
Compensated	4	5

EVAR = endovascular aneurysm repair.

number of vascular claims. The claims were mainly due to nerve lesions (Table 5). In Period A, 12 of 26 (46%) and in Period B 14 of 25 (56%) were compensated ( $p = .48$ ).

Claims for injuries after limb arterial surgery increased by more than 100%, from 34 to 72, between the two periods (Table 4). Settled claims increased from 18% (6/34) in Period A to 24% (24/71) in Period B ( $p = .09$ ) (Table 4). Lower limb claims were mainly due to amputation, bleeding, and infections.

The causes of negligence claims are shown in Tables 3–5. The majority of these claims for open aortic surgery were

**Table 4. Claimants undergoing peripheral (lower limb) surgery in Period A (2005–2007) and Period B (2012–2014)**

Claimants	Period A (n = 35)	Period B (n = 78)
Male/female	12/23	46/32
Median age of male/female – y	65/74	71/72
University hospital	12	36
<i>Claimed injuries</i>		
Amputation	3	11
Bleeding	6	15
Venous thrombosis	0	1
Infection	5	9
Neurological injury	5	13
Renal insufficiency	1	1
Vascular occlusion	3	2
Stroke	2	3
Decubitus	2	7
Other	8	16
Claim compensated	7	29

**Table 5. Claimants undergoing carotid artery surgery in Period A (2005–2007) and Period B (2012–2014)**

Claimants	Period A (n = 26)	Period B (n = 24)
Male/female	20/6	12/12
Median age of male/female – y	65/70	71/68
University hospital	20	15
<i>Claimed injuries</i>		
Bleeding	2	0
Stroke	8	5
Horner's syndrome	1	1
Cranial nerve injury	14	18
Other	1	1
Claims compensated	11	14

caused by intestinal injuries ( $n = 8$ ) and for EVAR neurological complications ( $n = 7$ ).

The claims as a result of all kinds of arterial procedures in relation to the number of procedures registered in Swedvasc were in Period A 99 (84) of 16 628 (0.6%) and in Period B 169 (158) of 20 669 (0.8%), an increase of 60% ( $p = .05$ ). There was a relative increase in number of claims to LÖF due to treatment of arterial diseases vs. all surgical claims between Period A (99/2 594, 3.3%) and Period B (169/4527 3.7%) ( $p = .34$ ).

In Period A, claims for treatment of aortic disorders were settled in 17% (4/23), which was less than in Period B, 40% (22/55) ( $p = .03$ ). In Period A, eight out of 23 (35%) claims were related to endovascular procedures and in Period B 21 out of 55 (38%) ( $p = .42$ ). In the Swedvasc registry, there was a significant increase in endovascular procedures for aortic aneurysm between these two periods from 34% (1144 of 3387 procedures) to 54% (2069 of 3866); an increase of 59% ( $p = .03$ ).

In Period A 83% (19/23) and in Period B 60% (33/55) of the claims after treatment for aortic diseases were not accepted as negligence as these adverse events were mainly considered as non-avoidable complications. This indicates a relative increase in compensated claims of 135%.

In Period A, five out of 23 claims (19%) for aortic disease were after endovascular repair, none being compensated for, and in Period B the corresponding frequency was 21 out of 55 (35%). In five of the endovascular procedures in Period B, the claims were settled. In Period B, a total of five out of 2069 endovascular procedures (0.24%) resulted in a settled claim vs. four out of 1791 open procedures (0.22%). There were 17 out of 23 claims (74%) after open abdominal aortic surgery in Period A and 31 out of 55 (56%) in Period B. Of these, 24% (4/17) and 45% (14/31) were settled ( $p = .03$ ) (Table 3).

There was a relative decrease in carotid artery surgery from 19.2% to 14.8% of the registrations in Swedvasc (Table 2) and also a relative decrease in negligence claims to LÖF between the two periods (from 26% to 14% of the 3860 procedures). The claims were mainly due to motor or sensory nerve lesions (Table 5). In Period A, 11 out of 26 (42%) and in Period B 14 out of 24 (58%) claims were settled; a non-significant increase of 33%.

Claims for injuries after peripheral limb arterial surgery increased by more than 100% between the two periods. Settled claims increased from 20% (7/35) in Period A to 35% (28/79) in Period B ( $p = .04$ ). The majority of these claims were caused by bleeding, eventually causing infections and amputations (Table 4).

## DISCUSSION

Sweden is the first country to have a special insurance system to compensate for injuries during healthcare (in place since 1975). A similar but less liberal system is present in New Zealand, whereas in other countries the patient has to show that there has been a mistake or neglect from the healthcare personnel. The benefit of the Swedish system is that the patient can be financially compensated irrespective of whether there is negligence or not.

This is also the reason why there have been no similar studies published, but there are a huge number of reports on complications after various vascular procedures; this is also common knowledge in any textbook on vascular surgery. Only a minority of patients seek financial compensation. Unavoidable complications/injuries, however, are not compensated for, even when there is a claim.

This retrospective study is unique in analysing negligence claims in vascular surgery during a period when endovascular treatment was under development and a later period when endovascular treatment was fully established in Sweden. Between these periods, the number of arterial interventions registered in the national vascular registry Swedvasc increased by 30% while negligence claims as related to the number of vascular procedures, increased from 0.60 to 0.83%, i.e. by 39%.

The overall 28% increase in claims to LÖF and the concomitant reduction in compensated claims from 44% to 40% may indicate that patients have become more observant and aware of their rights and of the possibility of seeking financial compensation, when they consider they have been maltreated. Another explanation may be the Swedish Patient Safety Act, introduced in 2011, which among many things states that a caregiver has a legal obligation to inform the patient if an injury has occurred, and to help the patients to seek redress.

After analysing claims in arterial surgery since the start of the insurance system in 1975, there has been an increase in claims from less than 10% during the first 10 years to more than 53% during the last period of this report.<sup>4,5</sup>

A separate issue, not analysed in this communication but nonetheless important, is the medicolegal aspects of maltreatment and clinical negligence, which has to do with whether the treatment has been based on scientific knowledge and evidence, and whether the individual surgeon may be responsible. In Sweden, financial compensation for the patient is separated from the supervisory and legal part of the individual, which is handled by the Inspectorate of Care and Social Services (IVO). There may be a tendency towards defensive medicine to prevent legal negligence claims,<sup>6</sup> a non-desirable development which can

be counteracted by a reliable separate financial insurance system like the one scrutinised in this report. The patients with adverse events often state that they do not want to blame or sue their surgeon, but want an explanation of what happened, an explanation, and financial compensation for their suffering and loss of income.

The data on patients undergoing arterial vascular surgery as reported to the Swedvasc registry are “highly accurate” as evaluated by a recent international external validation,<sup>3</sup> the validity being more than 96%, which is stable compared with previous national validations.<sup>7,8</sup> Since 1994 the registry has covered all vascular procedures in the whole country. This fact, together with an increasing tendency to file a claim, indicates that the frequency of negligence claims is reliable. This means that the increasing use of endovascular treatment, if anything, has not led to an increasing tendency for patients to ask for financial compensation. In its present Swedvasc data register protocol, however, there is no possibility to identify patients with complications who should have been compensated for by LÖF. To identify such patients would require a detailed analysis of all individual hospital records. Moreover, there are indications that the most severe complications are underreported.<sup>9</sup>

Neurological injuries and infections belong to the most common adverse events, which, although not always compensated for, may indicate potential and common areas for quality improvement. This is important information from an analysis such as this one. It may, moreover, identify rare events and cases where data otherwise may be unavailable. It may also contribute to the identification of mechanisms responsible for adverse events, thus improving the possibility of successful prevention. Risk assessment and management is becoming increasingly stressed in the healthcare system.

Moreover, further important information is that there were 11 patients who experienced decubitus and five burn accidents, injuries that were compensated for. Such events are considered as avoidable and caused by insufficient adherence to preventive routines and should consequently be followed by improvements. Every such injury can result in major suffering for the individual.

One limitation with this study is the various patient motivations to file a claim. Claims may also be biased by the severity of the adverse event. From a patient’s point of view, it seems important that they are informed about their legal and financial rights and about the function of the insurance system. There should also be organised facilities to help patients negotiate the bureaucratic system, which is crucial with increasing numbers of older and fragile patients.

What have not been analysed in this study because of lack of data are diagnostic errors and mistakes, and how avoidable ones should be taken care of. Lack of diagnostic vigilance is the main contributor for successful negligence claims in the UK.<sup>10</sup> In cases of arterial rupture and acute ischaemia there is an important time factor, making diagnostic delays very problematic and having a crucial impact on the outcome.

One field of vascular surgery, where endovascular treatment has not reached a high acceptance, is the treatment of carotid artery stenosis, and that conservative attitude is in fact supported by randomised trials and systematic reviews, where open surgery still is the significantly better option as far as results and complications are concerned.<sup>11–13</sup> It is also reflected in the Swedvasc registry, where less than 10% of the procedures are endovascular. In the claims to LÖF, the frequency of neurological adverse events seems stable, although there is a non-significant halving of the number of strokes, which is the most severe post-operative complication, a complication which surgical treatment should actually prevent.

A great number of injuries and adverse events are avoidable and hopefully they will decrease in frequency if colleagues adhere to the European guidelines on aneurysm, peripheral artery, and carotid surgery, although the guidelines do not specifically deal with insurance problems and the systems may moreover differ between countries.<sup>14–16</sup>

### CONFLICT OF INTEREST

P.G. is employed by LÖF as Chief Medical Officer and D.B. and L.O.H. are medical advisors of the company.

### FUNDING

None.

### ACKNOWLEDGEMENT

The authors are grateful to Lena Lindberg for assistance.

### REFERENCES

- 1 Nilsson L, Risberg MB, Montgomery A, Sjö Dahl R, Schildmeijer K, Rutberg H. Preventable adverse events in surgical care in Sweden. A nationwide review of patient notes. *Medicine* 2016;**95**:1–72.
- 2 Rudström H, Bergqvist D, Ahlberg J, Björck M. Insurance claims after vascular surgery in Sweden. *Eur J Vasc Endovasc Surg* 2011;**42**:498–505.
- 3 Venermo M, Lees T. International vasculnet validation of the Swedvasc registry. *Eur J Vasc Endovasc Surg* 2015;**50**:802–8.
- 4 Rimér U, Bergentz S-E. Behandlingsskador efter operation på periferia och centrala kärl. *Läkartidningen* 1981;**78**:2935–6.
- 5 Arnerlöv C. Kärllirurgisk erfarenhet av cirkulationskontroll och noggrann teknik krävs. *Erfarenhet Av Patientförsäkringsfall Läkartidningen* 1995;**92**:1809–10.
- 6 Frati P, Busardo FP, Sirignano P, Gulino M, Zaami S, Fineschi V. Does defensive medicine change the behaviours of vascular surgeons? A qualitative review. *Biomed Res Internat* 2015. <https://doi.org/10.1155/2015/170692>. ID 170692.
- 7 Kragsterman B, Persson H, Lindback J, Bergqvist D, Björck M. Outcomes of carotid endarterectomy for asymptomatic stenosis in Sweden are improving: results from a population based registry. *J Vasc Surg* 2006;**44**:79–85.
- 8 Tröeng T, Malmstedt J, Björck M. External validation of the Swedvasc registry: a first-time individual cross-matching with the unique personal identity number. *Eur J Vasc Endovasc Surg* 2008;**36**:705–12.
- 9 Elfström J, Stubberöd A, Tröeng T. Patients not included in medical audit have a worse outcome than those included. *Int J Qual Health Care* 1996;**8**:153–7.
- 10 Markides GA, Subar D, Al-Khaffaf H. Litigation claims in vascular surgery in the United Kingdom’s NHS. *Eur J Vasc Endovasc Surg* 2008;**36**:452–7.

- 11 Luebke T, Brunkwall J. Carotid artery stenting versus carotid endarterectomy: updated meta-analysis, meta-regression and trial sequential analysis of short-term and intermediate- to long-term outcomes of randomized trials. *J Cardiovasc Surg* 2016;**57**: 519–39.
- 12 Moresoli P, Habib B, REynier P, Secrest MH, Eisenberg MJ, Filion KB. Carotid stenting versus endarterectomy for asymptomatic carotid artery stenosis: a systematic review and meta-analysis. *Stroke* 2017;**48**:2150–7.
- 13 Lokuge K, de Waard DD, Haliday A, Gray A, Bulbulia R, Mihaylova B. Metaanalysis of the procedural risks of carotid endarterectomy and carotid artery stenting over time. *Br J Surg* 2018;**105**:26–36GJ.
- 14 Wanhainen A, Verzini F, van Herzele I, Allaire E, Bown M, Cohnert T, et al. European Society for Vascular Surgery (ESVS) 2019 Clinical practice guidelines on the management of abdominal aorto-iliac artery aneurysms. *Eur J Vasc Endovasc Surg* 2019;**57**:8–93.
- 15 Aboyana V, Ricco JB, Bartelink M-L, Björck M, Brodman M, Cohnert T, et al. 2017 ESC Guidelines on the diagnosis and treatment of peripheral arterial diseases (with ESVS). *Eur J Vasc Endovasc Surg* 2018;**55**:305–68.
- 16 Naylor R, Ricco JB, de Borst GJ, Baumgartner I, Clement D, Collett JP, et al. European Society for Vascular Surgery Guidelines on the management of atherosclerotic carotid and vertebral artery disease. *Eur J Vasc Endovasc Surg* 2018;**55**:3–81.

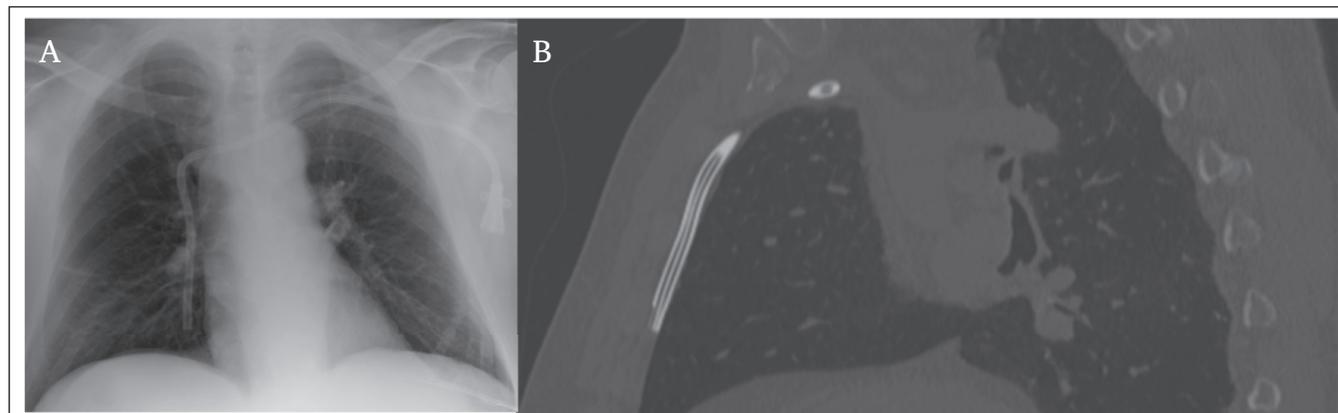
Eur J Vasc Endovasc Surg (2019) 58, 776

## COUP D'OEIL

# Inadvertent Placement of a Central Dialysis Catheter in the Right Internal Mammary Vein

Gino Gemayel<sup>\*</sup>, Marek Bednarkiewicz

Hopital de la Tour, Meyrin, Switzerland



A 54 year old male on haemodialysis was admitted for central dialysis catheter insertion. A left subclavian vein approach was used, with good blood reflux from both catheter lumens, but the post-operative chest X-ray indicated the catheter laterally malpositioned outside the superior vena cava (SVC; A). Thoracic computed tomography scans revealed the catheter was in a large right internal mammary vein (RIMV) (B). X-ray projections of the RIMV over the SVC probably gave the impression that the catheter was in the correct position. The catheter was replaced over the wire with a new one correctly positioned in the SVC.

<sup>\*</sup> Corresponding author. Hopital de la Tour, Meyrin, Switzerland.

E-mail address: [contact@dragemayel.ch](mailto:contact@dragemayel.ch) (Gino Gemayel).

1078-5884/© 2019 European Society for Vascular Surgery. Published by Elsevier B.V. All rights reserved.

<https://doi.org/10.1016/j.ejvs.2019.07.029>