A planned vascular surgeon consultation/participation versus emergency vascular surgeon participation in oncologic surgery - a comparative cohort study

George Galyfos, PhD; Alexandros Chamzin, MSc; Thea Ioannou, MD; Panagiotis Gkarbunof, MD; Sami Chatzikalil. MD; Athanasios Emmanuil, MD; Frangiska Sigala, PhD; Konstantinos Filis, PhD; Dimitrios Theodorou, PhD

Vascular Surgery Unit, First Department of Propedeutic Surgery, National and Kapodistrian University of Athens, Hippocration Hospital, Athens, Greece

Abstract:

Introduction: Oncologic surgery maybe a challenge, especially when the tumour lies in the proximity of major vascular structures. This study aims to compare main outcomes between a a planned vascular surgeon (VS) consultation/participation versus an emergency VS participation among patients undergoing oncologic surgery.

Methods: This is a retrospective study conducted in a university department of general surgery. All included patients underwent an oncologic surgery within a 6-year period (January 2019-December 2024). Main early outcomes were compared between two groups: Group A (planned VS consultation/participation) versus Group B (emergency VS participation). Main early outcomes included 30-day mortality, intraoparative blood loss, days of ICU stay, days of hospital stay, major cardiac events and major limb events (ischemia or amputation)

Results: A total of 93 patients were included (Group A = 41 versus Group B=53). Demographics were similar between the two groups. Gynaecological tumours and colon/rectal tumours resection were the most frequent types of surgery in Group B. Although Group B presented with 9.6% 30-day mortality compared to null mortality in Group A, this was not statistically significant. Group B was associated with a higher blood loss (6.3 blood units vs 2.2 blood units, p=0.01) and a longer hospital stay (9.8 days vs 6.6 days, p=0.02).

Conclusions: Planned VS consultation/participation to oncologic surgery seems to yield favourable early outcomes compared to emergency VS consultation. This must be verified considering late outcomes as well. This also raises concerns regarding a more extensive vascular training for all oncologic surgeons.

Key-words: oncologic surgery, vascular injury, vascular consultation, vascular participation, comparative study, early outcomes

INTRODUCTION

Iatrogenic vascular injuries have been increased in the last decades, especially with the increase of endovascular procedures.[1,2] Reconstructing any vascular injury can be challenging for surgeons who do not routinely perform vascular reconstruction.[1,2] Vascular surgeons are therefore called to assist other surgical specialties when an injury occurs or preoperatively to plan an oncologic procedure when the tumour lies in the proximity of large vessels.[3] As surgical oncologists, urologists, and colorectal surgeons increasingly resect anatomically complex tumours with curative intent, vascular surgeons are called to reconstruct the associated vascular anatomy, hoping to improve the quality and safety of R0 resections, where margins of the resected specimen are microscopically free of cancer cells, through a multidisciplinary approach.[4,5]

Although the role of a vascular surgeon in the treatment of iatrogenic injuries has been addressed by several studies, there is limited data on a direct comparison of outcomes between a planned and an emergency vascular surgeon consultation. Therefore, aim of this study was to compare outcomes between a planned vascular surgeon consultation/ participation and an emergency call when a vascular injury occurs during an oncologic procedure.

METHODS

This was a retrospective study including patients that were treated with oncologic surgery in our university department. All patients were treated within a 6-year period (January 2019-December 2024). This was a comparative study that compared major outcomes between two Groups of patients: Group A (a planned vascular surgeon [VS] consultation or participation to the procedure was scheduled) versus Group B

Author for correspondence:

George Galyfos

Vascular Surgery Unit, First Department of Propedeutic Surgery, National and Kapodistrian University of Athens, Hippocration Hospital, 114 Vasilissis Sofias Avenue, Athens, Greece, 11527
Tel: +30 2132088132
Fax: +30 2107707574
E-mail: georgegalyfos@hotmail.com
doi: DOI: 10.59037/1anv1274
ISSN 2732-7175 / 2025 Hellenic Society of Vascular and Endovascular Surgery Published by Rotonda Publications

(emergency VS participation to the procedure due to vascular injury). Major outcomes included 30-day mortality, cardiac adverse events (myocardial infarction, acute heart failure or major arrhythmia), limb events (acute limb ischemia or emergency limb revascularization or amputation), mean blood loss, mean ICU (intensive care unit) stay, mean hospital stay.

All main demographics were recorded including mean age, gender, main comorbidities, type of cancer, type of oncologic surgery, type of vascular injury and repair when occurred.

Statistical analysis was conducted using the StatsDirect Statistical software (Version 2.8.0, StatsDirect Ltd, Cambridge, UK). P values were calculated for evaluating statistical significance, with a P of less than 0.05 indicating a statistically significant difference. All variables and outcomes were compared between the two Groups using the x^2 Fischer test for non-numerical parameters and Mann-Whitney test for numerical parameters.

RESULTS

In total, 93 patients were analyzed in this retrospective study. Group A (planned VS consultation/participation) included 41 patients and Group B (emergency VS participation) included 52 patients. Mean age for all patients was 62 (46-78) years of age and 54.8% were of male gender.

Basic demographics did not differ between the two groups. (**Table I**)

The most common cancer types addressed in Group A were Sarcoma (36.5%) and Pancreas cancer (24.4%). The most common cancer types in Group B were gynecological tumours (36.5%) and colon/sigmoid cancer (19.2%). Sarcomas were more frequent in Group A than Group B, and gynecological tumours were more frequent in Group B than in Group A. (**Figures 1-7**)

Regarding the location of vascular injury, iliac arteries and iliac veins were more frequently injured in Group B compared to Group A. (p = 0.0001)

Regarding the type of vascular injury, ruptures/lacerations (p = 0.0001) and retroperitoneal hematomas (p=0.008) were more frequent in Group B compared to Group A. The other types of injury were similar between the two groups.

Regarding the type of treatment, conservative treatment (p=0.004), suturing (p=0.0002) and ligation (p=0.002) were more frequent in Group B, while other types such as bypass grafting or patch placement were similar between the two groups.

Regarding the main outcomes, 30-day mortality was similar between the two groups (Group A: 0% vs Group B: 9.6%, p>0.05). However, blood loss was higher in Group B (6.3 blood units vs 2.2 blood units, p=0.01) as well as mean hospital stay was higher in Group B (9.8 days vs 6.6 days, p=0.02). Other outcomes such as cardiac events, limb events, DVT/PE (deep venous thrombosis/pulmonary embolism) or ICU stay were similar.

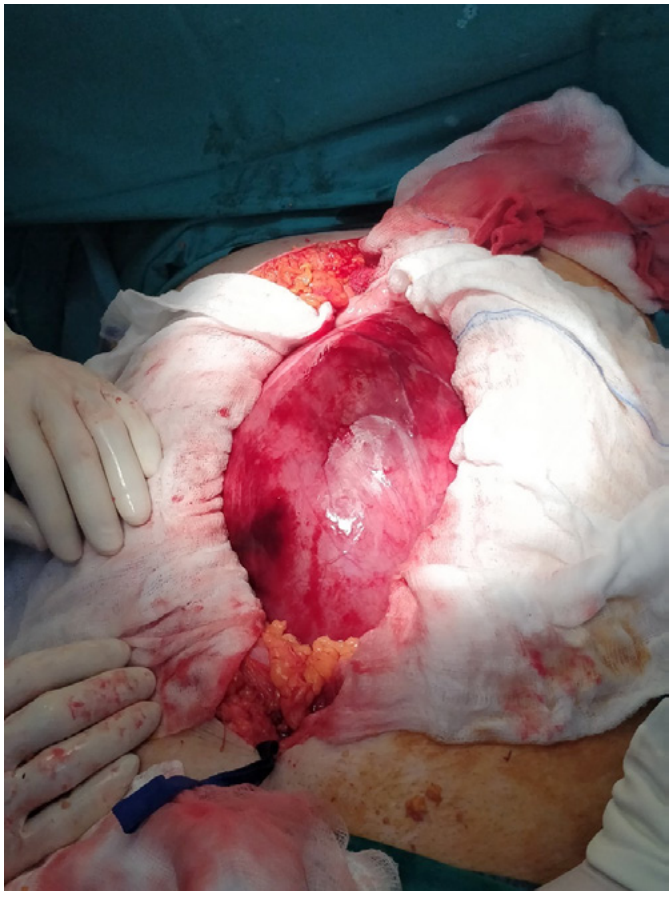

Fig 1. Intra-abdominal teratoma covering the entire abdominal cavity (planned vascular surgeon participation).

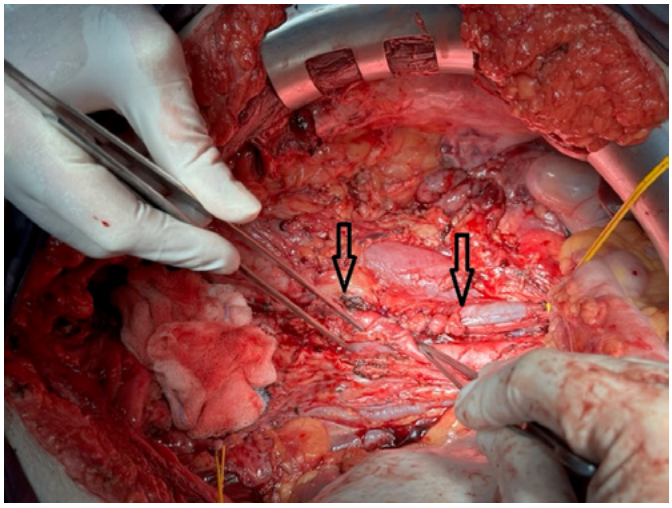

Fig 2. Resection of recurrent retroperitoneal sarcoma – emergency rupture of the inferior vena cava (IVC) and the right common iliac vein (CIV). Emergency vascular surgeon participation – Suturing of the IVC and right CIV (between the arrows).

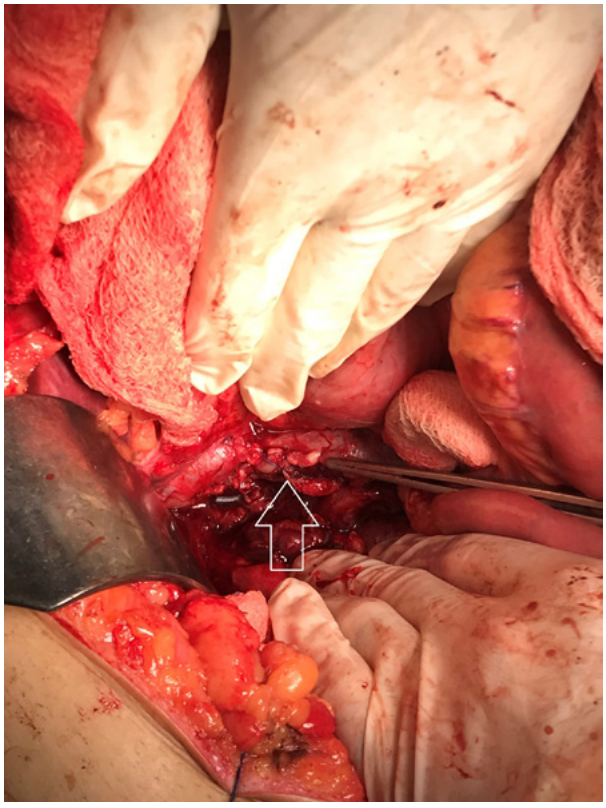

Fig 3. Resection of right renal carcinoma with extensive thrombosis of the right renal vein extending to the inferior vena cava (IVC). Nephrectomy and suturing of the IVC after removal of the kidney (arrow - planned vascular surgeon participation).

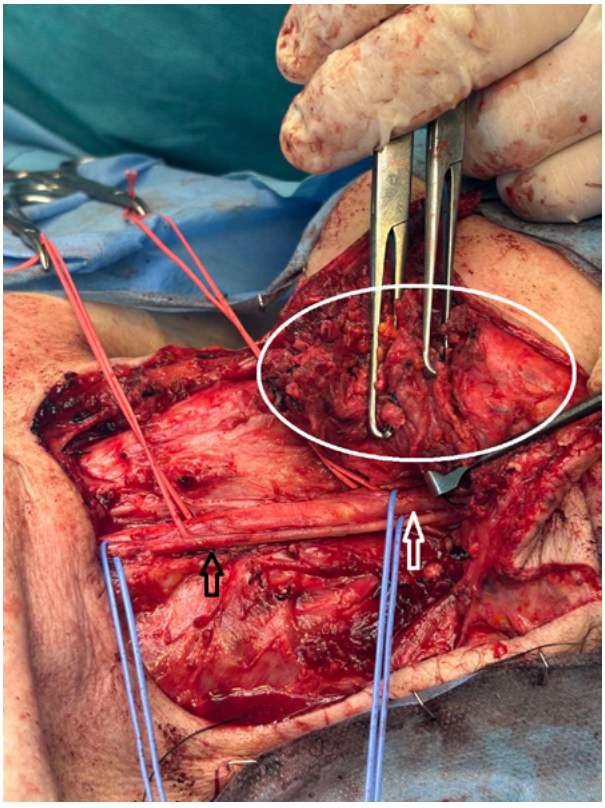

Fig 5. Extensive dissection of the carotid bifurcation due to recurrent tumour of the tongue - The white circle points out the tumour, the white arrow shows the internal carotid artery and the black arrow shows the vagus nerve (planned vascular surgeon participation).

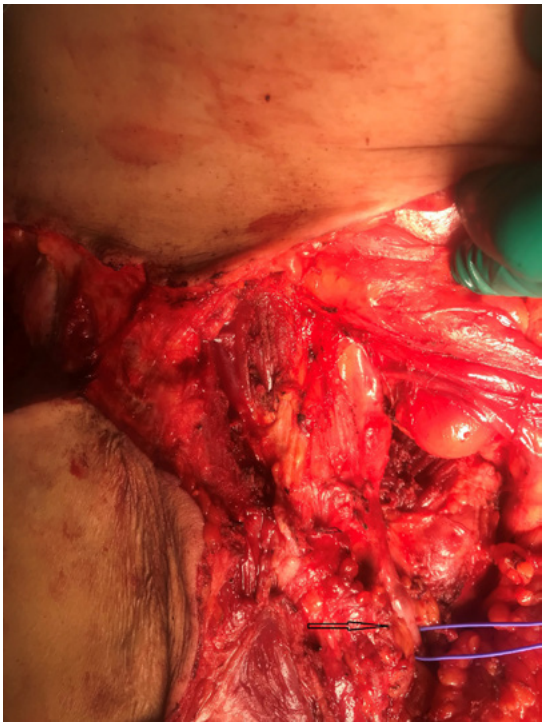

Fig. 4. Extensive resection of a sarcoma located in the right upper femoral area – Arrow shows the superficial femoral artery (planned vascular surgeon participation).

Fig 6. Synthetic aorto-hepatic bypass graft due to hepatic artery transection during a hepatic carcinoma resection. (emergency vascular surgeon participation)

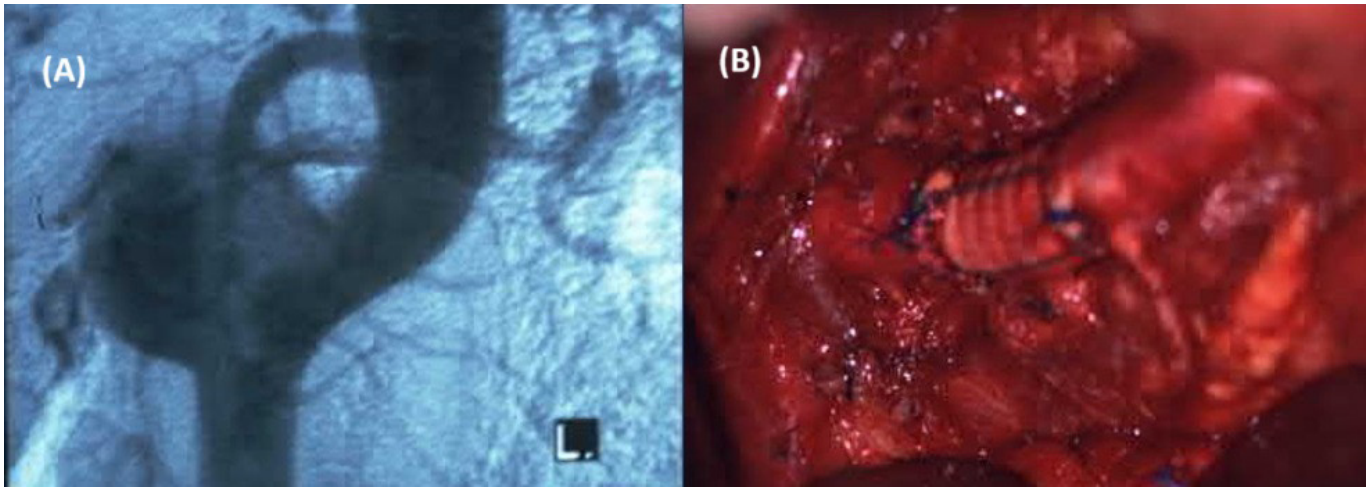

Fig 7. (A) Abdominal aortic pseudoaneurysm formation right after resection of retroperitoneal sarcoma. (B) Emergency vascular surgeon consultation leading to patch placement at the abdominal aorta.

DISCUSSION

In this retrospective study we reported that planned VS consultation/participation to oncologic procedures is associated with better early outcomes compared to emergency VS consultation/participation due to a vascular injury.

Regarding the type of procedure associated with vascular injury, we found that gynaecological procedures were more associated with emergency VS consultations compared to sarcomas where a planned VS consultation was more frequently requested. According to a former cohort study, general surgery procedures were the most frequent procedures associated with iatrogenic vascular trauma followed by the cardiology endovascular procedures.[1] Dancyc et al. reported that 46% of intraoperative consultations referred to surgical oncology compared to other specialties such as orthopedics or urology.[6] This concurs with the present study. However, in a recent cohort study, only 9.6% of all procedures that requested VS consultation referred to surgical oncology, with spinal surgery being the most frequent.[7] In another study by Tomita et al., more than 60% of the cases requested a VS consultation and they were for vascular exposure and avoidance of bleeding, whereas only 14.4% of cases were due to bleeding and a 19% required a vascular reconstruction.[8]

The most frequent type of vascular injury in this study was rupture or laceration and retroperitoneal hematomas in Group B compared to Group A. This could be justified also as iliac arteries and iliac veins were more frequently injured in Group B. Therefore, we found that the most frequent treatments included conservative treatment in case of hematomas and ligation or suturing in case of ruptures/lacerations in Group B compared to Group A.

Regarding early outcomes, we found similar 30-day mortality between groups although emergency VS consultation/participation was associated with 9.6% mortality compared to null deaths after planned VS participation. This concurs with Blackwood et al. who found a 7.2% 30-day morality in their cohort.[9] However, we found more blood loss and a larger hospital stay associated with emergency VS interference. This concurs with the study by Bobadilla-Rosado et al. where the authors found almost twice the loss of bleeding during a retroperitoneal oncologic resection when a VS was requested in an emergency setting. Additionally, the authors have associated the emergency VS interference with low long-term survival too.[10] This raises the question if an oncologic surgeon should receive a training in vascular surgery as well. Raj et al. have highlighted in their study that there is a visible 'gap' in skills training of an oncologic surgeon that could be filled with proficiency in vascular surgery.[10]

A scientific approach and international collaboration are needed, so that we can better identify which patients should be operated, what problems to anticipate and could be avoided with better planning, and which solutions improve patient outcome.[12] Degano et al. have conducted a systematic review evaluating vascular complications during oncologic ovarian surgery and reported almost 2.7% pooled rate of vascular injury during such type of surgery.[13] Ovarian cancer surgery is characterized by a comparatively low risk of vascular complications, as it involves an intraperitoneal pathology, with nearly all surgical interventions occurring at the peritoneal-intraperitoneal interface. There are some exceptions: debulking of lymphadenopathy in advanced ovarian cancer and recurrences, often retroperitoneal, usually in patients who have undergone surgery or other treatments, leading to higher surgical complication risks or any type of pelvic and para-aortic lymph node dissection. Therefore, the authors proposed a risk classification system that classified the patients into low, medium and high risk for vascular complications.[13] High-risk patients have experienced major vascular complications, display significant imaging anomalies, and have undergone multiple previous surgeries. There is a high probability of necessitating lymphadenectomy or advanced abdominal retroperitoneal surgery, with a body-mass-index below 16 or exceeding 30, alongside severe coagulation abnormalities alterations. A vascular surgeon should be present or immediately available, and advanced vascular surgical instruments should be on hand. We believe that such cases of increased risk for vascular com-

plications should be discussed preoperatively before every type of oncologic surgery, and a vascular surgeon should be present and help dissecting major vascular structures.

There are several limitations in this study. First, this is a retrospective study associated by certain bias of data collection. Second, this study underestimates the overall contribution of vascular surgical expertise to the operative management of primarily non-vascular patients. Third, any vascular surgical participation in the management of iatrogenic injuries occurring outside the operating room such as in the angiography suite or cardiac catheter laboratory was not included. Finally, no late outcomes were reported. The advantage regarding later outcomes should be verified by studies with longer follow-up.

To conclusion, vascular surgeons are essential supporting staff to all surgical specialists, and a diverse vascular-oriented skill set in open training coupled with broad anatomic knowledge is necessary for all oncologic surgeons. The emergency intraoperative VS consultation/participation to an oncologic operation seems to be associated with more blood loss and longer hospital stay compared to planned VS consultation/participation, although early mortality seems similar.

REFERENCES

1 Galyfos G, Kerasidis S, Stefanidis G, Stamatatos I, Kastrisios G, Giannakakis S, et al. Iatrogenic and non-iatrogenic arterial injuries in an urban level I trauma center in Greece. Int Angiol. 2016;35:526-530.

2 Filis K, Arhontovasilis F, Theodorou D, Albanopoulos K, Lagoudianakis E, Manouras A, et al. Management of early and late detected vascular complications following femoral arterial puncture for cardiac catheterization. Hellenic J Cardiol. 2007;48:134-142.

3 Filis K, Sigala F, Stamatina T, Georgia D, Zografos G, Galyfos G. Iatrogenic Vascular Injuries of the Abdomen and Pelvis: The Experience at a Hellenic University Hospital. Vasc Endovascular Surg. 2019;53:541-546.

4 Zamora C, Castillo M, Puac-Polanco P, Torres C. Oncologic Emergencies in the Head and Neck. Radiol Clin North Am. 2023;61:71-90.

5 Khanna L, Vargas D, Menias C', Katabathina V. Oncologic Emergencies in the Chest, Abdomen, and Pelvis. Radiol Clin North Am. 2023 Jan;61(1):91-110.

6 Danczyk RC, Coleman J, Allensworth J, Azarbal AF, Mitchell EL, Liem TK, et al. Incidence and outcomes of intraoperative vascular surgery consultations. J Vasc Surg. 2015;62:177-182.

7 Soto C, Tarabey S, Hamilton C, Ciaramella MA, Malanowski A, Rahimi SA, Beckerman et al.. Intraoperative Vascular Assistance: Essential to an Institution's Ability to Provide Surgical Care. Ann Vasc Surg. 2022 May;82:112-119.

8 Tomita TM, Rodriguez HE, Hoel AW, Ho KJ, Pearce WH, Eskandari MK. Implications of Intraoperative Vascular Surgery Assistance for Hospitals and Vascular Surgery Trainees. JAMA Surg. 2016;151:1032-1038.

9 Blackwood SL, O'Leary JJ, Scully RE, Lotto CE, Nguyen LL, Gravereaux EC, et al.#. Emergency intraoperative vascular surgery consultations at a tertiary academic center. J Vasc Surg. 2020;71:967-978.

10 Bobadilla-Rosado LO, Lopez-Pena G, Verduzco-Vazquez AT, Laparra-Escareno H, Anaya-Ayala JE, Azcorra H, et al. Five-year survival after retroperitoneal oncologic resection with and without vascular surgeon intervention. Vascular. 2023;31:868-873.

11 Raj P, Losty PD, Corbally MT. Should Pediatric Surgical Oncologists Receive Training in Vascular Surgery ? A Practice Survey Report From the International Society of Paediatric Surgical Oncology (IPSO). J Pediatr Surg. 2024;59:1605-1610.

12 Vikatmaa P. Emergencies during oncovascular surgery: Strategies and pitfalls. Semin Vasc Surg. 2023 ;36:157-162.

13 Degano M, Arcieri M, Frigatti P, Scrivere P, Zermano S, Driul L, et al. Exploring Vascular Complications in Ovarian Cancer Surgery: A Narrative Literature Review with a New Management Proposal Algorithm. Healthcare (Basel). 2025;13:270.