Damage-control vascular surgery in Canada: supporting surgeons and teams

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SUMMARY

In Canada, trauma patients often present initially to non-trauma hospitals without vascular surgeons on site. Local surgeons need skills and support for damage-control vascular surgery. Canadian training programs in general surgery should equip trainees with skills in this area, including resuscitation, identification of vascular injury, hemorrhage control, and temporizing measures (e.g., shunts, ligation). Caring for trauma patients is a multidisciplinary endeavour; understanding local/regional skill sets and from whom to seek help is vital. Opportunities for skills maintenance should also be encouraged for surgeons practising at sites where acutely injured patients present.

The bleeding trauma patient requires urgent intervention to save their life. In Canada, our geography and health care resources often mean that hemorrhaging patients first present to non-trauma hospitals without vascular surgeons on site. Local surgeons need the skills, supplies, and support to be able to provide initial damage-control vascular surgery to save life and limb and to facilitate transfer to a higher level of care (HLOC) facility.

Almost one-quarter of people in Canada live more than an hour away from a Level I or II trauma centre. For an actively bleeding patient, an hour may be the difference between life and death. More than one-third of patients with major vascular injuries in Canada are transferred from non-trauma hospitals. Thus, the ability to identify and initially manage a major traumatic vascular injury must remain within the scope of surgeons practising at any site where acutely injured patients may present.

Not every surgeon needs to be able to perform a vascular anastomosis or bypass; however, surgeons do need to be able to perform damage-control vascular surgery. The principles of damage-control vascular surgery include resuscitation, identification of vascular injury, control of hemorrhage (pressure, packing, tourniquets), temporizing measures (shunts, ligation), and planning for definitive care.

Modern general surgery training may not equip surgeons to perform damage-control vascular surgery. For example, increasing volume of minimally invasive retroperitoneal dissection may leave residents with inadequate experience performing open procedures. Decreasing volumes of axillary and groin dissections for oncologic surgery may mean residents lack familiarity with junctional vascular exposures. With fewer general surgeons maintaining a head and neck practice, graduating residents may not be capable of performing an emergent neck exploration. Changes to mandatory rotations in orthopedic and plastic surgery for general surgery residents leave fewer opportunities to operate on extremities.

Previously, vascular surgery rotations supplemented such skills. However, since vascular surgery became a direct-entry residency program, the requirements for vascular surgery rotations within general surgery training programs now vary nationally. Several general surgery residency programs do not require a vascular surgery rotation, and of those that do, many consist of only 1–2 blocks at the junior level. Depending on the structure of the rotation,
provide opportunities for both collaboration and learning, practice, identifying local expertise in vascular control can for skill maintenance and to obtain continuing professional
overcome both financial and geographic obstacles to
ATOM, DSTC); funding and protected time can help
supplement hemorrhage-control training (e.g., ASSET,
programs should provide support for trauma courses that
and leveraged for skill acquisition. Furthermore, residency
vascular surgery), so these opportunities can be identified
larly practised (e.g., hepatobiliary, head and neck, open
functioning within systems where arterial control is regu-
tion objectives and resident participation should be modi-
ted to ensure trainees gain appropriate experience in open
arterial exposure and damage-control techniques. Initially,
customized EPAs should be created to support trainees in
achieving these skills. Ultimately, national-level EPAs for
damage-control vascular surgery should be defined. Within the Competence by Design (CBD) framework, curriculum maps can help programs identify local opportun-
ties to fill gaps in training for hemorrhage-control
techniques. All Canadian general surgery programs are
functioning within systems where arterial control is regular-
y practised (e.g., hepatobiliary, head and neck, open
vascular surgery), so these opportunities can be identified
and leveraged for skill acquisition. Furthermore, residency
programs should provide support for trauma courses that
supplement hemorrhage-control training (e.g., ASSET,
ATOM, DSTC); funding and protected time can help
overcome both financial and geographic obstacles to
course participation.

After graduation, such trauma courses can be retaken
for skill maintenance and to obtain continuing professional
development (CPD) credits. Moreover, when starting practice, identifying local expertise in vascular control can
provide opportunities for both collaboration and learning, supporting a culture of preparation for high-acuity/low-
frequency events.

Appropriate supplies to perform damage-control vas-
cular surgery are also required. Even the most skilled
practitioner is ineffective without adequate equipment. Resuscitation bays must have tourniquets, packing, and
functioning portable Doppler ultrasonography equip-
ment. Operating rooms need vascular clamps, vascular
shunts, vessel loops, Fogarty catheters, and appropriate
sutures. Ideally, these items are stored together, or their
location is well documented to ensure rapid access. Simu-
lated practice or product review to ensure familiarity
among end users is also recommended. Local or regional
simulation programs may be able to support logistics and
be eligible for CPD credits.

Postoperatively, the plan for definitive patient care may
involve other sites and other practitioners. In Canada, traumatic hemorrhage control is a team effort and requires
support to be successful. Just as other multidisciplinary
teams (e.g., trauma teams, code blue teams) benefit from
training with key colleagues and equipment, those particip-
ating in hemorrhage control can benefit from familiarity
with hemorrhage care pathways and locally available
resources. For example, knowing where tourniquets are
located, knowing where the shunts are and how to use
them, and knowing what vascular clamps are available will
support patient care in likely unfamiliar and highly stress-
ful situations. Similarly, understanding local/regional skill-
sets and from whom to seek help is also vital. In Canada,
vascular trauma is likely to be managed by a multidisci-
plinary team. In fact, a Canadian review of major vascular
trauma found that 17 different specialties were involved in
managing these injuries. Thus, local pathways should be
clarified to save time and allow for hemorrhage control or
potential limb salvage.

Damage-control vascular surgery should also be incor-
porated into local/regional trauma system quality-
 improvement approaches. Case reviews should include
both feedback on successes and opportunities for improve-
ment in order to increase both system knowledge and per-
formance for vascular trauma. Better capture of vascular
trauma data can help inform performance and training for
both trainees and practising surgeons.

Surgeons should be able to perform damage-control
vascular surgery. Skills to resuscitate a bleeding patient,
identify vascular injury, control hemorrhage, temporize,
and plan for definitive repair must be enshrined in surgical
training programs; opportunities to learn arterial exposure
and control should be clarified to ensure gaps are identified
and supplemented with courses that teach hemorrhage-
control techniques. Opportunities for skill maintenance
should also be encouraged for surgeons practising at sites
where acutely injured patients present. With the appropri-
ate equipment and support from local/regional expertise,
life- and/or limb-saving surgeries can be available to all
Canadians.

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