

## ROUNDTABLE DISCUSSION

# Perennial Preparedness: Vascular Trauma Embolization

A discussion on strategies for embolotherapy in trauma patients, including how to prepare the center, the level of additional training required, and the need for effective communication between specialties.

WITH SHAWN SARIN, MD, AND OTTO M. VAN DELDEN, MD, PhD

## What are the hallmarks of a center that is properly prepared for treating a trauma patient? What are the keys to facility and room readiness with respect to embolotherapy for trauma?

**Dr. Sarin:** I believe that everyone needs to be familiar with the types of balloons, stents, coils, plugs, and liquid embolics that are available on the shelf. I include stents, particularly stent grafts, in the list of essential trauma tools. The entire team—technologists, nurses, doctors—should have an idea of what's on the shelf and where it is. It is essential to know where these devices are so that they can be found quickly. The ability to deploy these devices rapidly is important because traumas frequently come in during inconvenient times. Another helpful idea is to leave a room ready and “on” at the end of the regular workday so that trauma in the middle of the night can be dealt with swiftly.

**Dr. van Delden:** All imaging equipment (including CT) should be available in the trauma bay/shock room or at least be very close to it. Imaging should be immediately available with very limited patient transfers, if any. There need to be dedicated trauma protocols for imaging and indications for embolotherapy. Interventional radiology (IR) should be immediately involved and consulted when there is suspicion of bleeding, even before imaging has been performed.

Ideally, a center needs multiple interventional suites so that it never takes a lot of time to have an empty room available for emergency cases. There should be one or more

hybrid operating rooms where embolization can be immediately performed followed by, or simultaneously with, surgery (eg, bone fixation, laparotomy). Interventional suites and hybrid operating rooms need to have enough space and infrastructure for the entire trauma and resuscitation teams (which can be quite a lot of people) and all of their equipment. There should also be 24/7 room availability, with the interventional team's (interventional radiologists and IR technicians/nurses) presence in < 30 minutes.

The necessity for a facility with multiple access options depends very much on the local infrastructure and logistics. For hybrid operating rooms, access via the regular access route (holding area) and emergency access straight from the trauma department can be very useful and time saving.

## What types of devices must be on hand at all times?

**Dr. van Delden:** Ultrasound for vascular access in hypotensive patients is mandatory. Other necessary devices are standard angio materials including 4- to 5-F catheters and microcatheters, standard 0.035-inch pushable coils and microcoils, Gelfoam (Pfizer, Inc.), particles and glue (used less commonly but should be available), stent grafts in different sizes, and closure devices (for coagulopathy or uncooperative patient anatomy).

**Dr. Sarin:** Stent grafts, closure devices (for large vessel access closure), occlusion balloons (with the appropriate sheath nearby), guide catheters, microcatheters, coils, plugs, and liquid embolics are all necessary tools to have on hand.

### Are there any notable differences in preparedness for mass-trauma events versus single-patient trauma scenarios?

**Dr. van Delden:** For mass-trauma events, there is a need for trauma coordinators in general but also for radiology and IR in particular because they triage patients and prioritize imaging (particularly CT), as well as access to IR and the operating room. Also, multiple radiology teams allow teams to focus on one patient at a time to avoid confusion and mixing up results. Patients should be labeled and identified with particular care because trauma cases are often anonymous. Multiple trauma rooms should be available, or improvised if necessary, each with mobile x-ray and ultrasound.

**Dr. Sarin:** We have a close relationship with our trauma surgeons, and they have detailed plans in place for mass casualties. Triage of patients is important to manage the sickest patients, and we rely on our trauma surgeons to determine how to manage capacity. On our end, we would have our on-call backup come in if the event happened after hours. During the day, it would be “all hands on deck.”

### Have past mass-trauma events changed the way your institution prepares for future such events? If so, in what ways?

**Dr. Sarin:** I wouldn't say that past mass-trauma events have changed our preparedness. I'd like to think we are always prepared for any event. However, metrics that monitor IR response times have been implemented over the past few years. A member of our team is evaluating the patient at the bedside within 30 minutes of a consult. This is faster than our stroke response times!

**Dr. van Delden:** Our center has had protocols and infrastructure for mass casualties for a long time. Based on experience and exercises, many adaptations and small improvements are constantly being made—but not so much in the field of IR.

### How has the emergence of embolotherapy in trauma affected the need for on-call interventional radiologists at your facility?

**Dr. Sarin:** Trauma has always been a part of our practice, but advances in embolotherapy and stent grafts have been major drivers for further adoption of embolotherapy in trauma. Being early adopters to new technologies has been essential. As a result of our success, the demand for our services has continued to grow. This has motivated us to try to expand the number of interventional radiologists in our call pool.

**Dr. van Delden:** It has become busier outside of office hours, as statistically two-thirds of all trauma incidents will happen after office hours. However, we have had a 24/7, on-call rotation for both interventional radiologists and IR technicians for more than 20 years, so everyone has been used to it for a long time.

### Is additional training required in order to be “trauma-capable”?

**Dr. van Delden:** Technical training in terms of how to use the angiographic and embolization materials can be done, to a large extent, during regular elective procedures. However, the specifics of trauma embolization require additional training (eg, quick decision-making on indications and procedure type, finding the balance between obtaining hemostasis in a speedy fashion and performing procedures safely). Simulation training mimicking different trauma scenarios can be very useful for this purpose.

**Dr. Sarin:** I would say that all fellowship-trained interventional radiologists are trauma-capable and would excel. Sure, there are some programs that see more trauma than others; however, a fellowship graduate likely has the skills to tackle almost anything that comes through the door. I suppose physicians who mostly practice diagnostic radiology may find the need to attend refreshers at large conferences—GEST or SIR, for example. However, I suspect those operators may not be at level 1 trauma centers.

Being facile with alternative access is important. Most interventional radiologists are very adaptable and can master any sort of arterial or venous access. I would suggest that operators stick to what they are most comfortable with because they generally will be quicker with execution. It can be helpful to have steerable sheaths if catheterization from femoral access is difficult, rather than converting to radial access in a tenuous moment. Thinking outside of the box is important! Last month, we had to perform direct pseudoaneurysm percutaneous access to seal catastrophic bleeds after both radial access and femoral access attempts had failed.

### What interspecialty interactions are required to ensure efficient care, both before and during an event?

**Dr. van Delden:** The trauma leader (usually a trauma surgeon), anesthesiology team, diagnostic radiologists, and attending interventional radiologist need to be in constant communication during the initial trauma evaluation. There should be established combined interdisciplinary protocols for imaging assessment as well as interpretation of imaging results and indications

for embolization. During the interventions, the anesthesiology and IR teams should constantly communicate about the hemodynamic status of the patient, the time pressure, and the need for additional arterial or venous access. After trauma events, good interdisciplinary cooperation and communication are key, including debriefing sessions and multidisciplinary team meetings to discuss what went well and what could be improved upon in future events. Finally, it is important to have regular mass-trauma exercises and drills with real-life scenarios or fake patients and evaluate the outcomes.

**Dr. Sarin:** Generally, the key players are the trauma center, the emergency department, and the intensive care unit. It's essential to have good, clear, efficient communication between teams. We use secure messaging on our phones so that teams can rapidly and effectively communicate. Other services, including orthopedics, cardiac, general surgery, and vascular surgery, are also involved with complex traumas, and good communication with all relevant teams is imperative. There is no place for turf

issues in trauma care. Teamwork can literally make the difference between life and death. ■

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