In select patients with gunshot wounds, no operation is sometimes a better option

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At one time, trauma surgeons considered an operation mandatory to treat gunshot wounds to the abdomen, but a study published online as an "article in press" on the *Journal of the American College of Surgeons* website has found that in selected patients, avoiding an operation—a practice known as nonoperative management—is an acceptable and effective treatment.

"Selective nonoperative management of abdominal gunshot wounds is safe and avoids unnecessary laparotomies, which are invasive open operations that may sometimes cause complications in the short and long term," said lead study author George C. Velmahos, MD, PhD, FACS, chief of trauma, emergency surgery and surgical critical care at Massachusetts General Hospital and the John F. Burke professor of surgery at Harvard Medical School, Boston. While severe gunshot injuries almost always require an operation to repair damaged organs, selective nonoperative management—known by the acronym SNOM among trauma care professionals—is an alternative for less severe injuries that do not involve any major organ damage or significant blood loss.

The researchers evaluated medical records of 922 gunshot wound patients admitted to 10 Level I and II trauma centers in New England from January 1996 to June 2015. The centers are members of the Research Consortium of New England Centers for Trauma (ReCoNECT). Of the 922 patients in the study, 707 (77 percent) had an immediate operation and 215 were managed with SNOM.

Trauma professionals determine the level of a patient's injuries by using a scoring system called the Injury Severity Score (ISS). The study subjects who had SNOM had an average ISS of 8 (moderate to serious) vs. 16 (severe) for those who had an operation. SNOM patients had significantly lower rates of complications (8.5 percent vs. 34.7 percent for patients who underwent an operation) and death (0.5 percent vs. 5.2 percent), and shorter stays in the intensive care unit (median of zero days vs. one) and hospital overall (median of two days vs. eight).

Of the patients initially assigned to SNOM, 8.4 percent eventually underwent an operation, none with complications related to the delay in having a procedure, and none of them died. Only one in the entire SNOM group died in the hospital due to a gunshot wound to the head.

Trauma teams have become more comfortable with the idea of not operating on abdominal gunshot wounds, Dr. Velmahos said, and one reason is the wider availability of sophisticated imaging technology. "The explosive evolution of high-speed, high-resolution, multi-slice CT scan has definitely made clinicians more comfortable to practice selective nonoperative management," Dr. Velmahos said. "A good, reliable CT scan that has been read by a qualified individual—that is, an attending radiologist and/or an attending trauma surgeon—can be very helpful because it can map the trajectory of the bullet quite accurately and tell the trauma team whether the bullet traveled through or close to internal organs, or if it traveled completely outside the abdominal cavity."

However, the key factor in determining the need for an operation still remains a good clinical exam, including the assessment of abdominal pain. "The patient will inevitably have pain around the gunshot wound site, but the question becomes, does the patient have pain away from this area?" Dr. Velmahos said. "If the latter happens, there's an injury inside the abdomen that has spilled blood or abdominal contents throughout the

abdomen." That situation would almost always dictate an operation, he said. Also, patients who are hemodynamically unstable—that is, have unstable blood pressure—should go promptly to the operating room.

Avoiding an unnecessary operation in a gunshot wound victim can be an important step in the patient's recovery, Dr. Velmahos explained. "The risks of a non-therapeutic laparotomy in any setting are real. Opening and closing the abdominal muscles, creating adhesions, providing general anesthesia, and intubating the patients are associated with multiple adverse events."

Previous studies by Dr. Velmahos and colleagues have shown that even with a SNOM policy in place, about 10 percent of those who undergo an operation may have a non-therapeutic laparotomy. He does not consider that rate excessive. "I've called it an irreducible rate of unnecessary laparotomy," he said. "If you tried to eliminate that 10 percent, you may risk missing injuries and delaying operations in cases that require an operation."

While SNOM has been embraced by many trauma centers, its adoption is not universal. "There are academic and community hospitals with high trauma volumes that practice SNOM based on their experience and available resources," Dr. Velmahos said. "The concept becomes more challenging for smaller community hospitals that lack the experience and/or resources." SNOM is not a panacea, he said. "Clinicians should practice what is best for their patients given the setting in which they work."

More information: Thomas Peponis et al, Selective Nonoperative Management of Abdominal Gunshot Wounds from Heresy to Adoption: A Multicenter Study of the Research Consortium of New England Centers for Trauma (ReCoNECT), *Journal of the American College of Surgeons* (2017). DOI: 10.1016/j.jamcollsurg.2016.12.055

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