Smoking and neurosurgical outcomes

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The effects of long-term cigarette smoking on morbidity and mortality have long been known. In a more immediate sense, smoking in the days and weeks before surgery can lead to morbidity and complications for many surgical procedures. In this review, researchers from the University of California San Francisco and Yale University examined the surgical literature and, specifically, the neurosurgical literature to characterize the impact of active smoking on neurosurgical outcomes. They found strong evidence for the association between smoking and perioperative complications throughout the surgical literature. A small number of published reports specifically focus on neurosurgical procedures. On the basis of their findings—higher rates of intraoperative blood loss, greater need for intraoperative transfusions, higher rates of postoperative complications, and, in some patients with cranial cancer, shorter survival times—the researchers conclude that there are strong reasons for neurosurgeons to urge their patients to quit smoking prior to surgery and to encourage nationwide efforts to promote smoking cessation before surgical procedures.

Details on the researchers' findings are discussed in "The impact of smoking on neurosurgical outcomes. A review," by Darryl Lau, M.D., Mitchel S. Berger, M.D., Dhruv Khullar, B.A., and John Maa, M.D., published today online, ahead of published today online, ahead of print, in the *Journal of Neurosurgery*.

To obtain their data, the researchers performed a PubMed search for the terms "smoking and neurosurgery" or "tobacco and neurosurgery" for the time period 1950 through 2012. Additional sources of information were

culled from reference lists of pertinent articles.

In their review, Lau and colleagues provide detailed descriptions of ways in which active smoking increases perioperative complications and cite numerous papers providing evidence of this. Specifically, the researchers cover the following topics:

- Cellular injury and blood vessel dysfunction, which lead to insufficient delivery of oxygen, nutrients, growth factors, and immune cells to cells and tissues
- Delayed wound healing and infection
- Excessive intraoperative blood loss
- Adverse cardiopulmonary effects

In their examination of relationships between cigarette smoking and the risks of neurosurgery specifically, the researchers focus on three articles that demonstrate clear adverse effects of smoking on perioperative outcomes and supplement these data with additional information on later post-neurosurgery outcomes in smokers. The researchers organized the study findings according the three major types of neurosurgical procedures.

Cranial Surgery

- In a study of 453 patients who underwent craniotomy for tumor removal, there were higher rates of intraoperative blood loss and postoperative complications and a lower rate of 1-year survival in active smokers compared with nonsmokers. Patients who quit smoking before surgery did not have the higher risks of complications and 1-year mortality.
- In a study of 320 patients with aneurysm-related subarachnoid hemorrhage who underwent clip or coil occlusion of the aneurysm, current smokers were more likely to experience

delayed neurological deterioration.
- Outside the perioperative period, the cerebrovascular literature shows abundant data on the association of smoking with risks of aneurysm formation, rupture, and hemorrhage. Studies of postoperative outcomes following aneurysm-related subarachnoid hemorrhage showed higher rates of pulmonary complications and risks of cerebral vasospasm. Greater rates of complications were identified following neuroendovascular procedures and after diagnostic cerebral angiography. In one neurosurgical study, altered wound healing and skin necrosis were reported among active smokers who underwent a cerebrovascular bypass procedure.

Spine Surgery

- In a study of 500 patients who underwent lumbar spine surgery, there was an association between smoking and increased blood loss and the need for blood transfusion during surgery.
- Outside the perioperative period, the neurosurgical spine literature shows substantial evidence of worse long-term outcomes among smokers, including delayed spine fusion, lower rates of spine fusion, and abnormal bone fusion. Additional evidence shows a higher risk of recurrent lumbar disc herniation after surgery in smokers.

Peripheral Nerve Surgery

- To date no study has focused on the link between active smoking and perioperative outcomes of peripheral nerve surgery.

In the Discussion section of this paper, the researchers describe evidence from clinical trials that show quitting smoking before surgery can lessen

the risks of perioperative morbidity. Lau and colleagues review various ideas on how long before an operation that smoking cessation should take place and discuss how the topic of smoking cessation can provide a "teachable moment," in which the surgeon can use an upcoming neurosurgical procedure as a catalyst for a change in health behavior. The researchers strongly encourage neurosurgeons to counsel their patients on preoperative smoke cessation. On a public policy level, the researchers urge neurosurgeons "to take the lead in catalyzing constructive changes to minimize the impact of tobacco smoking in the perioperative setting." The take-away message of the study according to lead author, Dr. John Maa, is "By utilizing the AAR (Ask, Advise, and Refer) strategy to counsel patients who smoke to stop preoperatively, neurosurgeons can improve the quality of surgical outcomes and enhance patient safety. The potential impact on healthcare savings and lives saved could be enormous."

More information: Lau D, Berger MS, Khullar D, Maa J. The impact of smoking on neurosurgical outcomes. A review. Journal of Neurosurgery, published online, ahead of print, June 28, 2013; DOI: 10.3171/2013.5.JNS122287