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Ethical considerations in the use of Pernkopf's Atlas of Anatomy: A surgical case study

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ABSTRACT

The use of Eduard Pernkopf's anatomic atlas presents ethical challenges for modern surgery concerning the use of data resulting from abusive scientific work. In the 1980s and 1990s, historic investigations revealed that Pernkopf was an active National Socialist (Nazi) functionary at the University of Vienna and that among the bodies depicted in the atlas were those of Nazi victims. Since then, discussions persist concerning the ethicality of the continued use of the atlas, because some surgeons still rely on information from this anatomic resource for procedural planning. The ethical implications relevant to the use of this atlas in the care of surgical patients have not been discussed in detail. Based on a recapitulation of the main arguments from the historic controversy surrounding the use of Pernkopf's atlas, this study presents an actual patient case to illustrate some of the ethical considerations relevant to the decision of whether to use the atlas in surgery. This investigation aims to provide a historic and ethical framework for questions concerning the use of the Pernkopf atlas in the management of anatomically complex and difficult surgical cases, with special attention to implications for medical ethics drawn from Jewish law.

Introduction

The history of anatomy is one of scientific knowledge gained at the "edge of cultures," sometimes transgressing this edge into the territory of crime and atrocities.[1,2] Despite this history, the ethical justification for using anatomic knowledge gained from the bodies of victims of atrocities has not been questioned, with one exception: the Pernkopf atlas. Eduard Pernkopf's *Topographische Anatomie des Menschen (Topographical Anatomy of Man)* was received as a well-regarded anatomic atlas featuring high-quality paintings, indeed, the first ever to use the 4-color offset printing technique.[3] Eventually published in 5 languages, the atlas was used internationally by anatomists and surgeons until the 1990s. At that time, an ethical controversy arose when it was revealed that the origin of the work took place in the context of the abusive political system of National Socialist (Nazi) Germany.[4–9] A historic investigation at the University of Vienna documented that many of the images in the atlas might have been derived from executed victims of the Nazi regime. An ethical debate ensued that revolved around the use of such images.[10–16] Despite restrictions in accessing the book by some libraries and the decision of the publisher to cease reprinting, the atlas continued to circulate in the used book market and on the internet with no disclosure of its history. It is assumed that thousands of copies remain in private collections. Individual surgeons continue to use the images because of their illustrative accuracy and quality.[17] Indeed, some atlas users believe that this visual information benefits patients by informing complex

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operative planning. So far, however, there exists no detailed ethical discussion of the potential benefit or harm for the patient in association with the use of the atlas. To illustrate the various ethical considerations relevant to the decision of whether to use the atlas in surgery, the following study presents a real patient case study and then recapitulates the main arguments from the historic controversy surrounding the use of the Pernkopf atlas. Our aim was to provide a historic and ethical framework for questions concerning justifications for the use of the Pernkopf atlas in the management of anatomically complex and difficult surgical cases.

Because the Pernkopf atlas was created under the degrading conditions of the Nazi regime, special consideration will be given to the implications for medical ethics drawn from Jewish law. Although many victims of the Nazi atrocities were not Jewish, the persecution of Jews in the Holocaust was a specific focus of the Nazi genocide that is unique among the many other genocides the world experienced then and, unfortunately, continues to experience.[18] No example of ethical guidelines exist on the use of data or images from these victims that include the *voice of victims*. In the specific context of Nazi Germany and the Holocaust, it is important to consider the voice of the principle group of victims, the Jews. This voice is expressed in a new responsum by Rabbi Joseph Polak in the "Vienna Protocol,"[19] so named because of the Vienna origins of the atlas. A *responsum* is a written reply by a rabbi or Talmudic scholar in response to a matter of Jewish law. The Pernkopf atlas and the guidelines of the "Vienna Protocol" are discussed here as having ethical relevance that goes beyond the Jewish context and may be applicable in other religious and secular settings, thus addressing all humanity.

A Case Study with Pernkopf's Atlas in the Operating Room

A 50-year-old woman presents to a peripheral nerve surgeon with the chief complaint of debilitating neuropathic pain on the medial aspect of the right knee and a complex history of knee replacements. She reports that her neuropathic pain began immediately after a partial knee replacement and worsened substantially after subsequent operative attempts of revisional knee surgery. At presentation, the patient reports 9 out of 10 pain, 9 out of 10 negative impact on her quality of life, and 6 out of 10 depression. She has exhausted multiple strategies for pain management and has stated that she would consider a leg amputation if the pain could not be resolved in any other fashion.

The surgeon makes a clinical diagnosis of saphenous nerve entrapment in the mid-thigh, and neuroma pain in the infrapatellar branch of the saphenous nerve. A corresponding Tinel's sign along the course of the infrapatellar branch and a positive clinical provocative test at the entrapment point can be elicited. The patient also responds to a saphenous nerve block at the supposed point of entrapment.[20] The patient is informed on the nature of the procedure and consents voluntarily to the decompression of the saphenous nerve in the thigh and excision of the involved neuromas with proximal transposition of the saphenous nerve for management of the neuropathic pain.

This surgeon has a reputation for being a leading expert in peripheral nerve surgery. Despite the surgeon's 30-year operative experience, the experience of the surgeon with operative release of the saphenous nerve was limited at the time of presentation. Because of the relative rarity of the procedure, the surgeon encounters intraoperative difficulty and frustration at not being able to locate and identify the saphenous nerve within the entrapment point, which is deep to the anteromedial (vasto-adductor) intermuscular septum and the distal infrapatellar branch. The surgeon proceeds to take an intraoperative time-out to determine how to proceed.

It is at this moment that the surgeon encounters an ethical dilemma in considering the use of Pernkopf's atlas to inform surgical planning. As a historic note, the surgeon received Pernkopf's atlas as a gift in 1982 when first beginning to practice. This atlas became an important anatomic reference for intraoperative anatomy because of its detail and accuracy for the peripheral nervous system. It was not until several years later in the mid-1980s that the surgeon first became aware of the controversy behind the origin of the book.[6]

History of Pernkopf's Anatomic Atlas

Throughout the past 3 decades, inquiries have been made regarding Eduard Pernkopf's and his illustrators' political background and about the origins of the human bodies depicted in the atlas. In the 1980s, the historically interested physician Gerald Weismann revealed Pernkopf as a member of the Nazi Party (NSDAP),[6] and the medical illustrator David J. Williams researched more than 800 original paintings from the atlas. During interviews with Franz Batke, the last surviving artist contributing to the atlas, Williams found that all illustrators of the atlas had Nazi sympathies or were members of the NSDAP.[8] Signs of this allegiance were clearly visible in several of the anatomic plates, with painter Erich Lepier adding swastikas to his signature (airbrushed out in later editions of the atlas), illustrator Karl Endtresser signing his double "SS" in the shape of lightning-bolt SS (*Schutzstaffel*) symbols, and Batke, shaping the 44 in the date 1944 as the SS runes (Fig 1). Williams addressed Pernkopf's atlas as a "troubled masterpiece." Inquiries continued in 1995, when the Professor of Complementary Medicine Edzard Ernst published a report in the *Annals of Internal Medicine* about Pernkopf's personal involvement in the removal of all faculty members who were of Jewish origin or political opponents in his role as Dean of the Vienna Medical School.[21] It was revealed that a majority of the medical faculty were dismissed, of whom most emigrated, some committed suicide, and others were deported to concentration camps and eventual death.[22]

In 1997, the former academic publisher Urban & Schwarzenberg (Vienna, Austria) acknowledged Pernkopf's NSDAP membership, but argued that there was no concrete evidence for the use of bodies from Nazi concentration camp victims for the creation of the atlas.[23] But after persistent inquiries by New York oral surgeon Howard Israel and Canadian physician William Seidelman, *Yad Vashem* (the Israel Holocaust and Martyrs Remembrance Authority) had sent an official letter in 1997 to the Austrian authorities and the University of Vienna, asking for an investigation into the origin of the atlas.[12,13,24] In that same year, the University of Vienna ultimately responded by admitting to a systematic suppression and denial of the Nazi past of the anatomy department,[25] and therefore created an historic research commission, the Senatorial Project of the University of Vienna.[9] The objectives of the Senatorial Project were to investigate the origin and destiny of the bodies used by Pernkopf, and determine the extent of his Nazi affiliations and political activities.[5]

The Senatorial Project ascertained that, during the Austrian Nazi period from 1938 to 1945, the Vienna Anatomical Institute received 3,964 unclaimed bodies from hospitals and geriatric institutions; 7 willed body donations; approximately 7,000 bodies of fetuses, stillborn babies, and children—all dead from natural causes—including 4 Jewish children; and at least 1,377 bodies of executed persons guillotined at the Vienna assize court after court trials or shot by the gestapo at a rifle range, including 8 of Jewish origin.

No evidence was found that bodies from the 2 concentration camps close to Vienna—Mauthausen and the affiliated camp Gusen—were brought to the anatomical institute, but such bodies were transported to the anatomical department at the University of Graz, Austria.[4,5] It should be noted that the anatomic use of

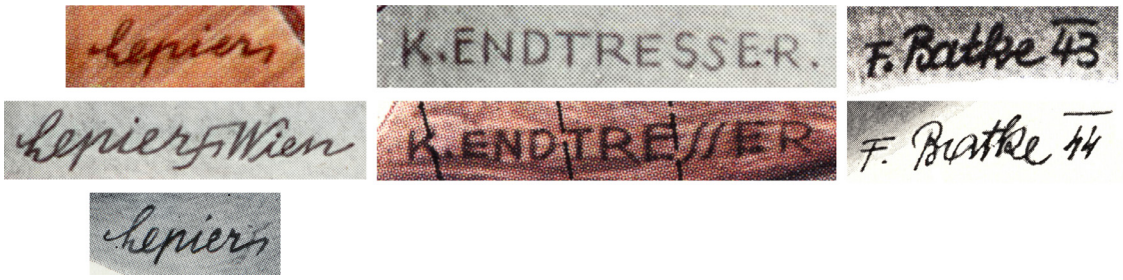

Fig. 1. Signatures of Pernkopf's illustrators demonstrating Nazi sympathies. Normal signatures without signs of Nazi sympathies (*top line*). Signatures with swastika and lightning bolt SS (Schutzstaffel) symbols (*middle line*). Lepier's signature was airbrushed to remove the appearance of the swastika in the second and third editions of the atlas (*bottom line*). Remnants of the swastika can be still be seen in some of his signatures. Endtresser's and Batke's lightning bolts remained unchanged.

unclaimed bodies from public institutions, including those of prisoners, children, and fetal remains, was traditional and legal at the time, and even included the bodies of executed persons; however, the quantity of bodies of executed prisoners and the reasons for executions had changed dramatically under the Nazi regime. More than half of the executions in Vienna had been carried out for political reasons, among them 526 verdicts of "high treason," which included offenses ranging from active political opposition to minor crimes. Of the 8 Jewish victims, 1 was claimed by the family after the anatomical institute waived its own claim to the body because of transportation difficulties in 1939, and the other 7 were delivered to the anatomical institute between 1942 and 1944.[26] The investigation also revealed anatomic specimens suspected to have originated from Nazi victims in various medical collections, which were then removed, and, on March 22, 2002, they were interred in an *Ehrengrab* (commemorative "grave of honor") provided by the city of Vienna.[4,5] It was ascertained that, of the 791 illustrations in the atlas, about half had been created either before 1938 or after 1945. A total of 41 plates were definitively based on bodies from the group of 1,377 executed victims. For the remaining approximately 350 paintings created between 1938 and 1945, the origin of the bodies used as models remained unclear.[4] The Senatorial Project did not consider the illustrations produced after the war as potentially based on bodies of executed Nazi victims; however, the Vienna Anatomical Institute retained a considerable number of these bodies for several years after 1945.[27]

The findings from the Senatorial Project sparked an ethical controversy surrounding the handling of Pernkopf's atlas.[9,16,28] Most medical libraries decided to retain and move the volumes into their special collections with the insertion of an historic note.[10,11] Although the former publisher Urban & Schwarzenberg ceased publication of Pernkopf's atlas in 1994,[28,29] the atlas continued to exist in the used-book market and on the internet, with no historic disclosure of its origin. The question of using images from the "tainted" work in surgical patient care remains an ethical dilemma and was part of a discussion during a 2017 conference on the "medical ethics in the 70 years since the Nuremberg Code."[30,31] Experts considered the question of whether to use data gained from coercive medical research in Nazi Germany and, in this context, discussed the use of information from anatomic research on the bodies of thousands of victims of the Nazi regime.

The Ethical Dilemma

The ethical question is the following: Should a surgeon cognizant of the historic background of the Pernkopf atlas use its images in patient care? Indeed, the atlas represents an example of Nazi medical scientists producing scientifically important anatomic work, and in various surgical specialties, surgeons have found value in using this atlas in the operating room to benefit patient care.[17] Whereas some of the more notorious medical experiments performed by Nazi scientists were horrific, scientifically flawed, and produced false data, others followed the scientific method, although under unethical conditions, and produced clinically relevant results.[32–39] Also, scientific medical work in Nazi Germany was, if not always innovative,[40] and contrary to claims by postwar scientists and physicians,[41] to a certain extent, similar to that performed in other political systems at the time and became part of the general canon of medical knowledge.[36,37] It is essential to examine the atlas within this historic context because Pernkopf operated under the specific conditions of the time, among them changes in the anatomic procurement that included an increasing number of bodies from victims of the Nazi government.[40] He and other anatomists contributed internationally used anatomical publications that were based on tissues from executed victims.[42–44] Whereas, by now, body procurement has changed, and unclaimed bodies in anatomy have been replaced with willed donor programs in most of Europe and the United States. Meanwhile, the papers and books based on data from the Nazi victims continue to exist within the body of scientific and anatomic knowledge. Any new ethical evaluation of the use of Nazi medical data needs to account for the perspective of those most affected (ie, the victims who were used in the experiments and rarely had an opportunity to participate in this discussion). Once forcibly subjected to medical experimentation, their voices cannot again be neglected in the debate concerning the use of data from these experiments.[45,46]

Jewish Ethics and Law by Rabbi Joseph A. Polak and Dr. Michael A. Grodin

With respect to victims of medical crimes, despite the revelations of the Nuremberg Medical Trial, there was very little consideration of the role of medicine in the crimes of the Third Reich. The "Great Silence" that extended for decades after World War II was a consequence of suppression and repression by academic leaders in universities, leading scientific institutions, and professional organizations. Pursuit of research in this subject was not career enhancing. In the late 1980s, credible documentation began to emerge, along with a growing body of research into the role played by medicine and medical science in the crimes of the Third Reich. Revelations included the discovery of the remains of victims of Nazi terror exploited by university institutes of anatomy and research institutes that had been part of the prestigious Kaiser-Wilhelm research organization, now known as the Max Planck Society. Because these discoveries occured during a more accepting academic and political climate, substantial and controversial ethical questions began to be asked. The Jewish ethical perspective is now emerging as an important consideration in an examination of these issues. As Jews stood at the center of Nazi persecution, destruction, and genocide, it is imperative to include the analysis of Jewish bioethics and law in the discussion.[45,46]

Several distinctions are made in Jewish law and ethics when addressing the permissibility of using the dead human body in education, research, and therapy. There is decreasing concern and growing acceptability as one moves from use of the whole body to body parts (organ tissue, bone), biopsies, and histology slides to photos and drawings. There is also a distinction in the justification for the use of human bodies for forensic reasons and the determination of the cause of death, pathologic confirmation of the diagnosis, and documentation of quality of care. There are differences between research and use of the dead human body as a resource for therapy, such as stem cells, tissues, and transplantation. Finally, there are questions about the use of dead human bodies for medical and anatomical education.

All Jewish ethics and law come ultimately from the written and oral Torah. All *Halakha* (Jewish law) starts with the sanctification of human life. In the Jewish religious tradition, the human being is created in G-d's image, thus the individual human being does not have ownership over his or her body. All medical ethics around the living and the dead in the Jewish tradition is subsumed under 3 grounding principles:

1. The sacredness of life. This includes human life; it also includes animal life (eg, a newborn calf may not be slaughtered on the same day as its dam), and vegetable life (concepts of sacred crops, sabbatical years, and not mixing of diverse seeds).
2. Divine rather than human ownership and proprietorship of the human body.
3. The human body even after death retains its identity as a sacred symbol of the divine and of what is sacred about the human, and in this double-symbolism, may never be desecrated.

Deriving benefit from a corpse is part of the broader halakhic category of *Nivul haMet* (the prohibition of physical desecration of the body). Early discussion of problems with the use of a dead human body appeared around the 17th century, raising the question whether the study of a corpse constitutes "benefit" from the deceased, which in itself is a prohibited activity in Talmudic law. A second prohibited category is *Halanat haMet* (leaving the dead unburied overnight). Halakha requires a quick and speedy *K'vura* (burial). Any delay constitutes a violation of *Kavod haMet* (respect for the dead). An *overriding* principle of Jewish Law is *Pikuach Nefesh* (saving a life). Normally, all halakhic considerations are suspended for *Pikuach Nefesh*. The 3 exceptions are murder, incest or adultery, and idolatry.

The Pernkopf atlas, the subject of this discussion, does not display the actual body, organs, or tissues of its subject, nor even photographs of it. It does, however, contain paintings. This representation moves the halakhic emphasis away from the object of the atlas (corpses, tissues, etc) to the representation of such body parts. The question now becomes the following: If someone in their will says, "You may copy my body parts for science after I die but before I am buried." Is this halakhically permitted? The answer here would be no, because the body, as we have seen, is not the property of the person who inhabited it.

Enter the Pernkopf atlas. The body, in fact, does not lie before us; only the paintings remain. Do the prohibitions of benefit, of no post-mortem overnight, and of representation extend to what is already here; and does the fact that these paintings are of victims of murder enter the moral argument?

We have argued elsewhere in the "Vienna Protocol" that they do,[19] but the fact that these are representational rather than real support limited permissibility when *Pikuach Nefesh* (as in surgery, and possibly medical education) is at play. Then the tertiary level of the paintings (from corpse to photograph to drawing) comes into play. Those halakhic authorities who condone studying anatomic remains under normal (ie, normally expired corpses) circumstances would also permit the study and use of pictures in the Pernkopf atlas; however, these same halakhic authorities would likely be reluctant to do so, it should be argued, unless the paintings carry an elaborate warning label describing the provenance of their subjects, and articulated an understanding of the controversy around the criminal acquisition of the corpses on which the drawings are based.

All would agree that, should the atlas be used, it should indeed be used with respect and gratitude and with appropriate solemnity. Moreover, if it is certain that if a single life can be saved using this atlas, then doing so would not only be permissible but probably mandatory.[47]

Discussion

In recognition of the fact that Pernkopf's atlas presents an ethical dilemma to its users because of the complex historic and potential religious implications outlined here, decisions on how to deal with this image resource will depend on the moral values of the individual user. Based on the principle of honoring and respecting the lives of those past, present, and future, the following discussion examines 4 of possibly many ways to proceed:

Option 1: Continue with the case and recognize a time to stop the procedure.
Option 2: Call a surgical colleague for emergency consultation in the operating room.
Option 3: Take an operative time out and consult an anatomy atlas other than Pernkopf.
Option 4: Take an operative time-out and consult Pernkopf's Atlas of Human Anatomy.

Option 1: Continue with the case and recognize a time to stop the procedure

The intraoperative decision to stop a procedure (operative time-out) at critical moments before proceeding is a hallmark of expert performance.[48] Stopping operative progression is an extreme manifestation of slowing down, where the surgeon recognizes the moment to acquire additional information before making a judgment. The surgeon may review the patient's file and imaging, ask a colleague for assistance, or consult anatomic resources. Operative time-outs are known to help decrease medical errors by recapping the operative progression, minimizing distractions, and proactively analyzing possible paths forward.[49] The decision to terminate a procedure typically comes when surgeons have exhausted all other resources and have recognized the limit of their own abilities to avoid doing harm to the patient, their first ethical obligation.

Despite having adequate surgical training to appropriately handle unplanned challenges in the operating room, rare or unusual cases do occur and present an increased risk for potential complications. This possible scenario was a driving force for the development of progressive specialization within surgery. Specialists have the experience required to handle difficult, complex, and rare cases for which they are considered "end-of-the-road" expert surgeons. Despite an increased volume of complex and rare cases, these surgeons can also encounter unplanned challenges, occasionally requiring an operative time-out. During these moments, the surgeon can assess options and either proceed with the operation or terminate the procedure if the risks of proceeding outweigh any potential benefit to the patient.

In the scenario we presented, the surgeon undertook a rare case referred by another surgeon who was unsuccessful in managing the patient's neuropathic pain. During the operation, the surgeon encountered difficulty in obtaining adequate exposure of the

saphenous nerve, and an operative time-out was taken to reassess and consider other options. In this situation, the surgeon must rely on his or her acquired knowledge and experience to judge what is best for the patient. If the surgeon sees no safe way to continue the operation, the decision to abort the case can be made.

Option 2: Call a surgical colleague for emergency consultation in the operating room

Seeking the opinion of a colleague may provide the surgeon with a new perspective on the situation and additional insight into how to proceed with the operation.[50] Encountering intraoperative technical difficulty and frustration can contribute to a greater mental workload, which has been associated with intraoperative complications during laparoscopic procedures.[51] The recognition of a stopping point to reassess and request assistance from a surgical colleague is a trait of expert performance.[48] Another surgical colleague(s) can provide another perspective and a "fresh set of eyes" for resolving the situation. A difference in surgical experience can contribute an alternative strategy or additional technical expertise. Furthermore, a second or senior opinion can also provide the appropriate rationale for aborting the case if other options are exhausted.

The ability to call for an emergency consultation with a specialist surgeon is a benefit often found at larger or academic centers. If a complex case was referred to an "end-of-the-road" surgeon, however, an emergency consultation may not provide a more experienced surgeon's opinion but rather a different perspective. In the scenario presented, the case was referred to an "end-of-the-road" expert surgeon at a large academic center. Although this surgeon could consult a surgical colleague, it is known that these consultations would not provide expertise on approaching the technical aspects of dissecting out the saphenous nerve because of the expert's level of experience for treating complex nerve cases compared with their surgical colleagues. Although asking for surgical assistance is one option for navigating surgical difficulty, this can be of limited value in cases where no other more experienced surgeon is available. Consulting other resources such as technical articles or anatomic atlases can be considered.

Option 3: Take an operative time-out and consult an anatomy atlas other than Pernkopf's atlas

It is said that the mark of a good resident is knowing when to ask for help. Why should this not hold true for a fully trained, even expert practicing, especially when faced with a rare or unusual problem? It is common practice to request the assistance of a more experienced colleague or consult another specialty surgeon intraoperatively when presented with an unexpected problem. It is, however, a rare occurrence in most operating rooms for a surgeon to reference an anatomic atlas. When there is no more experienced colleague available and the dilemma lies in navigating a difficult or rarely seen dissection that will present itself to even the most specialized surgeon, reference to an anatomic illustration may provide the necessary guidance. The surgeon can use the images of standard human anatomy to compare with the intraoperative anatomy and to assist in landmark identification for a safe and successful dissection of the nerve or structure in question.

Using radiologic imaging in the same way is commonplace and not considered a crutch. A general surgeon may have computed tomographic images projected on a monitor to identify the relationship of a tumor to key structures, or an orthopedic surgeon may reference plain radiographs in approaching a fracture. For procedures involving anatomy not easily seen on imaging such as peripheral nerves, especially those addressed surgically only in rare instances, there is no equally reliable imaging technique to guide the surgeon through a difficult dissection. An anatomy atlas may be an essential reference to have available in the operating room.

The surgeon may choose to reference a variety of anatomy texts. Most physicians were educated on an atlas other than that of Pernkopf, and the atlases in common circulation—Netter's, Gray's, Grant's, Sobotta's, and others—are adequate for general anatomy reference. They are, however, arguably much less detailed than the Pernkopf illustrations (Fig 2) in specific situations or scenarios.[17,52] Specifically, the Pernkopf atlas gives much more elaborate visual information in terms of the topography of peripheral nerves than any other of the anatomic atlases.[17] The surgeon can choose to reference a non-Pernkopf atlas for one of two reasons—for lack of availability of the Pernkopf atlas or for ethical opposition to its use. But in a case that poses a challenging dissection for a highly specialized surgeon, the question remains whether one of these standard atlases is sufficient.

Option 4: Take an operative time-out and consult Pernkopf's Atlas of Human Anatomy

The choice to consult Pernkopf's controversial atlas as an anatomic resource during an operation should not be taken lightly, indeed only under the conditions outlined earlier in this article. The fact that Pernkopf's atlas has become an integral part of some surgical practices signifies a gap in the anatomic and illustrative sciences and a need to develop a better anatomic resource that may put the apparent need to use the Pernkopf atlas to rest. But until that exists, the following discussion summarizes some of the ethical implications in the use of Pernkopf's atlas in complex or rare surgical cases.

Proceeding with the Surgery

The use of Pernkopf's atlas for treating patients to the best of one's ability should be an autonomous decision and should serve the principle of helping—and not harming—the patient.[53] This is where the ethical dilemma exists. Does one help the patient by using a resource derived from potentially unethical practices if it could help the surgeon proceed safely and successfully with the operation, or is the patient potentially harmed by his or her indirect association with a "tainted" resource? Does one make use of alternative resources, knowing that these may perhaps not resolve the issue at hand? The surgeon may not be able to consult with others for another opinion. The strict conditions laid out in the "Vienna Protocol" (saving human life, historically informed use, commemoration and honoring of the victims) provide an ethical option for the use of certain Pernkopf images in a manner that memorializes the potential Nazi victims[19] benefits today's patients. It is exactly these strict conditions and limitations that transcend the impact of the "Vienna Protocol" beyond the world of Jewish law into all contexts of modern medicine. At the center are self-restraint of the physician's choice, historic insight, and recognition of the humanity of the subjects in the images as well as of the patient to be treated.

Although many surgeons are now informed on the history of Pernkopf's atlas, this was not always so. For highly specialized surgeons—especially head, neck, and extremity surgeons—the atlas became integrated into their practice before the exposure of its history. It became an important, detailed, and erudite resource as they developed their practices, and the atlas gained a reputation for its anatomic accuracy. These surgeons view their work with the atlas as evolving with their practice and maintain that they attain new anatomic insight with experience. They have "learned to see,"

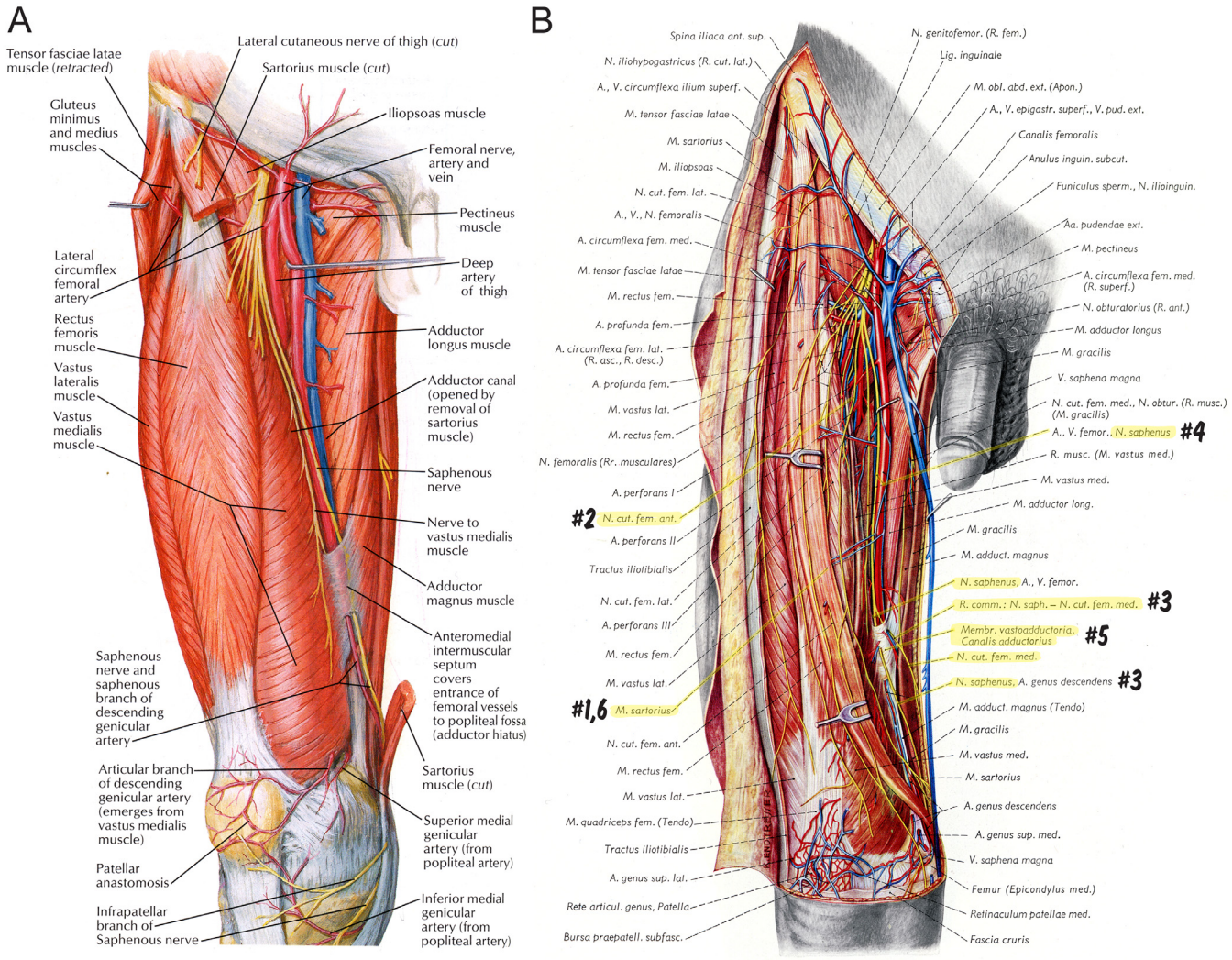

Fig. 2. Relevant anatomic and illustrative plate comparison. (*A*) Netter's Atlas of Human Anatomy. (*B*) Pernkopf's Topographical Anatomy of Man. The numbers cross-reference anatomic landmarks in the following surgical photos. (The authors explicitly honor the memory of the subject portrayed in the Endtresser's painting from the Pernkopf's atlas.)

because some of the formerly overlooked anatomic details can become more apparent with increased surgical expertise and critical observation: "It was always there, I never saw it." For some surgeons, Pernkopf's atlas represents arguably a pinnacle of anatomic illustration. Now, however, surgeons are obligated ethically to decide whether to continue using this resource. These specialized surgeons live in moral dissonance with their knowledge of the atlas's tragic past and they are required to make a judgment call in the operating room.

In the described case study, the surgeon returned to the operating room and chose to use Pernkopf's atlas, knowing that there was no other available image to aid progress through a difficult operative dissection. An image from this atlas was, for this surgeon, the only anatomic drawing available to navigate the complex anatomy of the saphenous nerve in this region. There was no other surgeon available with experience in this surgical exposure, and no other accessible anatomic resource that described the exposure in adequate detail. In this case study, the first author (Yee) emailed the senior author (Mackinnon) the requested, appropriate images from Pernkopf's atlas, on the basis of which the surgery was then completed successfully. The decision to use Pernkopf's atlas was based on having exhausted all other options and meeting the criteria of an ethical "checklist" as described.

In this specific surgical case (Fig 3), the following procedural steps outline the anatomic and surgical utility of Pernkopf's atlas:

1. Retraction of the superficial muscles (sartorius) to reveal the deeper layers, providing appropriate exposure to the anteromedial (vasto-adductor) intermuscular septum.
2. Protection of the anterior femoral cutaneous nerve on the operative approach and its distal innervation of the anterior/medial aspect of the knee.
3. Illustration of the saphenous nerve and its 2 distal nerve branches, which includes a communication branch for the medial femoral cutaneous nerve.
4. Lateral positioning of the saphenous nerve in respect to the femoral vessels.
5. Depiction of the septum tunnels from which the saphenous branches and vessels pierce.
6. Illustration of the vascular pedicle to the sartorius muscle.

The routine approach for nerve decompression in cubital tunnel surgery, median nerve in the forearm release, posterior interosseous nerve release, and others, is to identify the nerve proximally and follow its distal course for clear visualization and release of the intended anatomic structures. Release of the saphenous nerve is the opposite, in that you must have a more detailed

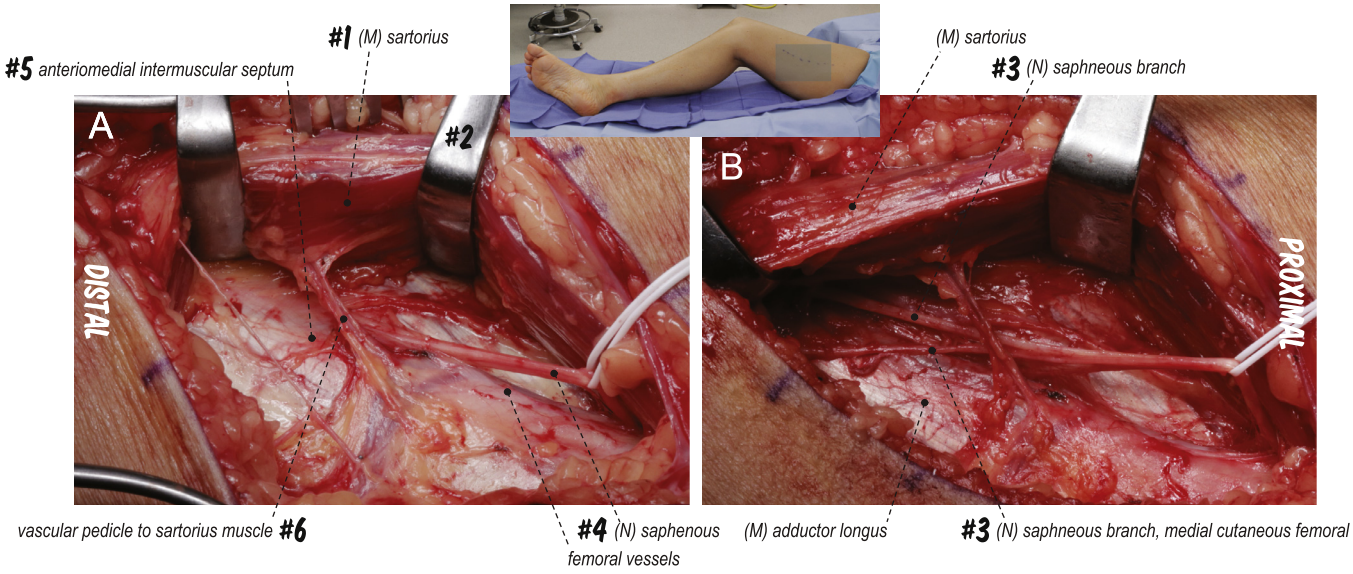

Fig 3. Saphenous nerve release for managing neuropathic pain. Numbers reference Pernkopf's illustration in Fig 2 of this article. (*A*) Exposure of saphenous nerve. (*B*) Decompression of saphenous nerve through release of the anteromedial intermuscular septum. *M*, muscle; *N*, nerve.

knowledge of the adjacent structures that obscure the nerve and identify other landmarks for decompression. Specifically, the saphenous nerve is hidden beneath the anteromedial intermuscular septum, and small cutaneous nerves with similar trajectories can be easily confused for the saphenous nerve. Palpating for the femoral artery orientates the dissection to look for the superior position of the saphenous nerve after a careful and blinded incision of the septum for exposure. These subtle and technical steps illustrate the difficulty of this delicate dissection and the involved potential frustration, in which a prominent surgical resource can alleviate and provide guidance.

Ethics Bottom Line: Returning to the Operating Room

The continued use of Pernkopf's atlas in clinical medicine presents an ethical dilemma that is multifaceted, complex, and debatable in nature. Use of this atlas requires a definitive judgment call that must be made by the surgeon within the operating room on how to further proceed with the operation. When faced with ethical dilemmas, ethically grounded surgeons consider all clinically defensible options and the foundational information in the case (ie, "all things considered") and then make decisions based on their professional responsibilities and moral values. As an unusually detailed anatomic atlas, the Pernkopf atlas's utility in informing complex or rare surgical problems is in tension with its ethically tainted origin, including the authors' ties to the Nazi regime and unclear origins of some of the bodies depicted. A surgeon or other clinician presented with a problem that requires consultation with a detailed anatomy reference should be aware of the history behind Pernkopf's atlas when deciding whether to use it. Ethical justifications can be and have been made for several options, from promoting the use of the atlas to honor the Nazi victims whose bodies were used in the creation of the anatomic illustrations, to removing the atlas entirely from medical libraries around the world. Nonetheless, the atlas is likely to persist in circulation in the medical community, especially in surgery, and transparency toward the historic facts and unanswered questions regarding its origin should be part of the discussion regarding its ethical handling in modern medical practice. An ethical use of images from Pernkopf's atlas should be subject to strict conditions and limitations, integrating the focus on saving the life of a patient with the memorialization of the persons whose bodies were used for the creation of the images.[31] The Pernkopf story and the application of the atlas in surgical patient care can serve as an ethical case study in the medical education and advanced training of surgeons.

Outcome of Surgery

In this case study, the patient involved with the use of Pernkopf's atlas recovered from the effects of the surgery and, despite a large scar, was gratifyingly free of pain for the first time in many years.

Dedication—This paper is dedicated to the memory of the unknown subject portrayed in Endtresser's painting from the Pernkopf atlas (Fig 2, *B* in this article) and all the other possible victims portrayed in the atlas.

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