JACC: CASE REPORTS VOL. 3, NO. 10, 2021

GUEST EDITORS' PAGE

Quo Vadis, Chirurgia Cardiaca?

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"Per aspera ad astra!"
—Lucius Annaeus Seneca

ORIGINS

Surgery is one of the ancient medical fields, existing as battlefield medicine for a long-time, first emerging in the Roman Empire. However, the lack of perioperative care and modern supportive diagnostics and medications, including antibiotics, did not allow surgery to flourish as it is known nowadays. Despite stepwise development, the grand picture did not change significantly in the next 15 centuries; training and education were delivered first on an individual basis and later in guilds. In the Renaissance, surgical colleges were established throughout Europe, although they served as trade unions rather than centers of academic knowledge. A pioneering academic surgical and midwifery university-level education was established in Vienna by Emperor Joseph II, who was more interested in sciences than in governing the realm. The Collegium Medico-Chirurgicum Josephinum not only served the Monarchy but also provided theoretical and practical surgical education on wax figures and cadavers for numerous European guest students starting in 1784. The University of Vienna stayed at the forefront of surgical academics, both technically and by incorporating allied sciences, resulting in the discovery of surgical hand hygiene, sterile technique, the medical thermometer, and blood groups, among others. A famous misprediction is also ascribed to this school; the surgical giant, Billroth, stated that the heart is untouchable. According to some quotes, this declaration referred only to the pericardial cavity (1), but the prophecy was refuted by the end of the 19th century in Frankfurt. Nevertheless, the pericardial cavity was first explored by Romero, using pericardiocentesis in 1801, nearly 3 decades before Billroth's birth; this procedure is the first recorded in the mediastinum (2).

EVOLUTION IN TIME

Major evolution in medical sciences led to a reformation of humankind, allowing higher life expectancy and better quality of life all over the world by the 20th century. The traditional distinction between medicinal disciplines and the surgical field was inadequate to establish a sufficient framework for medical education, diagnostics, and therapeutics; thus, specialized medicine emerged. After World War II, especially as a result of antibiotics, surgery experienced an explosive expansion, and the development of reliable perfusion techniques forwarded the evolution of cardiac surgery. From this point, the term of *cardiothoracic surgery* was born, albeit, from the very beginning, the primary connection between the 2 disciplines was organ location rather than diagnostic

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2021.07.002

or therapeutic approaches. Over the decades, thoracic surgery has stayed closer to general surgery, resulting mainly from the oncologic patient profile, and cardiac surgery has become increasingly a form of "operative medicine."

On the basis of pathophysiological features, diagnostic background, and therapeutic pathways, cardiology and respiratory medicine became independently recognized clinical fields from the 1960s. However, a similar clear-cut separation of the corresponding surgical disciplines has not happened in several countries, which claim a "historical bond" going back only a few decades. Nevertheless, only a handful of surgeons are left who practice in both fields at a high professional level, although neither the modern institutional setups nor the noninvasive pathways facilitate the constantly decreasing opportunities of a cardiothoracic surgeon.

PITFALLS OF REVALIDATION

Furthermore, significant improvement in clinical outcomes resulting from technological evolution in the last quarter-century and patient demand for lower-risk procedures attracted more legislative restraints on professionals that pushed in the direction of either thoracic surgery or cardiac surgery. Increasing complexity and length of specialty training have additionally contributed to this advance. Successful revalidation of a specialist qualification in the European Union requires full-time clinical activity and continuous medical education in the specified medical field for a consecutive period of 5 years. Consequently, previously obtained but not actively practiced clinical qualifications are not revalidated because of the previously noted legislative safeguards for patient safety, and nonrevalidated medical qualifications turn inactive; hence the bearer is not up to date in the latest guidelines or in novel therapeutic approaches, so the provider becomes effectively despecialized. If reactivation of a qualification is desired, 1 to 2 years of practice under supervision is demanded in most of the EU Member States, and this also contributes to additional patient safety. A similar trend can be observed even regarding subspecialities recently; mitral valve subspecialization can be maintained only by performing more than 50 procedures per year according to some national professional guidelines. The US Centers for Medicare & Medicaid Services mandate 25 surgical mitral valve procedures per year, at least 10 of which should be mitral valve repair, for patient insurance coverage acceptance (3). It has been clearly demonstrated that specialized aortic centers have 2- to 3-fold improved 30-day postsurgical clinical outcomes in treating type A aortic dissections compared with moderate-size, nonspecialized hospitals (4). Therefore, the recent expert consensus document on surgical treatment of acute type A aortic dissection published by the American Association for Thoracic Surgery in the *Journal of Thoracic and Cardiovascular Surgery* suggests transferring a patient suffering from this rapidly progressive, devastating disease to a comprehensive aortic center, when such a center is reasonably accessible (5).

LEGISLATIVE CHALLENGES

The European Union aims to standardize and unify systems in all Member States to achieve a unanimous, increased level of quality and safety to the benefit of all citizens. These objectives, with regard to the free movement of professionals within the European Union, 1 of the 4 pillars of the founding treaty, were partially addressed by Directive 93/16/EEC of 5 April 1993 (6). Automatic mutual recognition is granted only for listed medical fields; nonlisted fields practically do not exist. Except for cardiac surgery, the field performing the highest number of major inpatient procedures within the European Union, namely, coronary artery bypass operations (7), all other internationally recognized major surgical areas were listed in the Directive. Further standardization efforts led to Directive 2005/36/EC on the recognition of professional qualifications (8), setting a minimum of 6 years of university education and a further minimum of 4 years specialty training in medical fields and 5 years in surgical fields. Unfortunately, the list of automatically recognized medical qualifications was not comprehensively updated in Annex V, and cardiac surgery remained nonlisted. Despite an archaic appellation, the European Board of Cardiothoracic Surgery examination is separated into cardiac and thoracic domains. This examination could be a common link between the Member States, although a structural change undertaken in 2017 hinders compatibility with the European legislation and hence full acceptance by the Member States. Joint action by the European Association for Cardio-Thoracic Surgery and the European Society of Cardiology would be desired to end the de facto illegitimate status of cardiac surgery, thereby resulting in standardized training, improved accountability, and a higher level of patient safety by applying the same standards on the old Continent.

Another patient and employee safety measure, the European Working Time Directive, went into effect in 2003 (9), fixing the maximum hours worked per week

at 48. Employers' immediate response was concern raised about medical training during such a shortened work week, although mainly economic considerations drove the perturbation, and the next 2 decades have proven only the benefits of the regulation. However, a strong hierarchy, heavy workloads, high responsibilities, and slow progression have already discouraged the millennium's upcoming generation from joining cardiosurgical training. This trend was partially and temporarily improved by an external influx of trainees into the system, although it failed to provide a long-term solution because of multifaceted circumstances.

TRANSFORMATION OF PRACTICE

Additionally, unlike in other surgical fields, a large proportion of minimally invasive approaches have migrated to the fellow medical field, cardiology, as a result of medicopolitical decisions. Most of these minimally invasive procedures are performed in low-risk patients, and conventional surgery is mainly reserved for complex, higher-risk patients. This change has created challenges for early-stage training. In contrast, vascular and thoracic surgeons have remained active in diagnostics and minimally invasive procedures, by performing their own angiographies, bronchoscopies, and stent placements. The change became even more apparent with the emergence of new structural heart procedures, including transcatheter aortic valve implantation (TAVI) and mitral valve procedures. Thus, a considerable proportion of lower-risk, single procedures transitioned from cardiac surgery to cardiology. The shift was recently reinforced by the outcomes of the PARTNER 3 (Placement of Transcatheter Aortic Valves) trial: among patients with severe aortic stenosis at low surgical risk, the rate of mortality, stroke, or rehospitalization at 1 year was significantly lower with TAVI than with surgery (10). Furthermore, the 5-year outcomes of TAVI and surgical aortic valve implantations in patients at intermediate risk revealed no significant difference in the incidence of death or stroke at 5 years after TAVI compared with surgical aortic valve replacement (11). However, it must be recognized that in this study rehospitalizations were more common in the TAVI group. Moreover, the incidence of paravalvular leak was 5.33-fold and the need for reintervention was 4-fold in contrast to the surgical patients. Therefore, even in this short follow-up period, surgical procedures provided a better quality of life. It is evident that in elderly patients, the immediate postoperative outcomes favor transcatheter procedures, but most of these patients undergo only 1 conventional surgical valve procedure in their lifetime because the surgical valves function for 1 or 2 decades. Time will tell the realistic longevity of TAVI valves. Nevertheless, TAVI is no alternative to a mechanical valve replacement in younger patients, who are still present in a significant proportion outside of North America and Europe.

CARDIAC FUTURE

Another aspect is that a medical specialization does not cover manual procedural training sufficiently, and patients with complications that arise return to surgical care even in lower-risk cases. In the current era, a multidisciplinary heart team approach is starting to spread around the globe. This represents the most beneficial modus operandi for patient outcomes, and it has additional economic advantages. Thus, the border between cardiologists and surgeons has melted away, delineating the future of cardiac care: the invasive and noninvasive cardiac sciences. This model was first proposed in the innovative settings of the University of Zürich, Switzerland (12). The foregoing silent revolution probably represents the future of the cardiac profession, with the need for a new career model of professional pathway, work-life balance, and proportionally powered financial compensation, in contrast to the current nonspecific public reimbursement systems. After a sufficient transitional period, this new career model may restore the sparkling spirit of the 1980s to the cardiac sciences and attract a large cohort of enthusiastic fresh trainees to benefit the public health system and overall well-being.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS cardiovascular disease, coronary artery bypass, health care economics, percutaneous coronary intervention, thoracic, valve replacement