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EDITORIAL

Adrenalectomy: Is Volume a Surrogate for Quality?

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During the past decade, the relationship between surgical volume and patient outcomes has been well documented with relation to complex cancer surgery. In this issue of *Annals of Surgical Oncology*, Roman et al. have highlighted this topic as it pertains to adrenalectomy. In their analysis of more than 6,000 patients, the authors have made a number of important observations regarding the relationships between patient demographics, surgeon/hospital volume, and outcomes after adrenal surgery. Most specifically, their study has drawn our attention to the potential interaction between patient age and surgical volume because these parameters affect clinical outcomes. For patients who undergo adrenalectomy for a variety of indications, age >60 years was associated with more complications, longer length of stay, higher costs, and increased mortality compared with younger patients. Regardless of age, these same outcome measures were improved if patients were treated by high-volume surgeons in high-volume centers, with the differences in outcomes being even more pronounced for the elderly. Ironically, the elderly patient population was the demographic group most likely to receive care in a low-volume hospital by a low-volume surgeon. This observation probably relates to the fact that the elderly may lack information regarding the options for referral to a specialized center and also tend to be more reluctant to travel outside of their local communities for medical care.

Compared with other operations performed by general surgeons, adrenalectomy has historically been a low-volume procedure. This point is evidenced by the criteria used to define "high volume" in the manuscripts published to date, which have studied volume-related outcomes for adrenalectomy (>4 cases per year for individual surgeons and > 6 cases per year for hospital volume).[1] During recent years, the number of adrenal lesions being diagnosed and subsequently referred for surgical evaluation has increased. This trend can be explained by several factors, most notably the increasing numbers of patients who undergo axial imaging for other reasons. As a result, clinically unsuspected "adrenal incidentalomas" may be found in 1–7% of patients imaged with CT or MRI, with prevalence increasing with age.[2,3] In addition, functional adrenal tumors represent the most common surgically treatable etiology for hypertension. As a result, more patients with poorly controlled hypertension are being evaluated for endocrine (adrenal) sources for hypertension. Finally, the availability of minimally invasive techniques for adrenal resection has likely increased patient and referring physician willingness to consider surgical alternatives to previously medically managed adrenal disease, such as hyperaldosteronism.

In light of the above-mentioned observations, we have noted that the volume of adrenal surgery in our institution increased dramatically from 2 cases per year between 1993 and 1997 to 15 cases per year from 1998 to 2003.[4] From 2006 to 2009, that number has increased from 24 cases per year to 62 cases per year, with the vast majority of these cases being concentrated between two surgeons specializing in laparoscopic solid organ surgery. Importantly, care of these patients has been part of a multidisciplinary approach to adrenal disease, which has involved surgeons, endocrinologists, radiologists, and pathologists. In reviewing our data on the most recent 154 patients who underwent laparoscopic adrenalectomy, average OR time was 156 minutes with mean estimated blood loss of 60 ml. There were three conversions to open surgery and the overall major complication rate was <1%. There were no deaths.[5]

Most volume-outcome assessments to date have focused on high risk, infrequently performed procedures associated with high mortality rates, such as esophagectomy and

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pancreatectomy. Although adrenalectomy is a relatively infrequently performed procedure in most institutions, perioperative morality rates remain quite low (<1% overall). Mortality is, therefore, probably not the best endpoint for analysis of volume-outcome measures for adrenalectomy. To draw more accurate conclusions, we will be obligated to look at other outcome measures that are admittedly more difficult to obtain but are probably more relevant for low mortality procedures, such as adrenalectomy. These include complications, length of stay, and cost. In the elderly, we also must seek to capture more meaningful variables, such as discharge to home (vs. assisted living/skilled nursing facilities) as well as long-term quality of life and return to independence. As noted in the manuscript cited in the current issue, the elderly are prone to a higher rate of complications after adrenalectomy and are least likely to be able to tolerate these complications without impacting both their short-term and long-term recovery. It makes sense that this group of patients may benefit most by referral to a high-volume center.

As surgeons who seek to provide high-quality care, we must place continued emphasis on improved delineation of clinical parameters, which may help to direct our decisions regarding which patients may be most appropriately managed in high-volume centers. In applying these principles to inherently low-volume procedures, such as adrenal surgery, an argument can be made for centralization of care for all adrenalectomies. As minimally invasive equipment and techniques have evolved during the past decade, laparoscopic adrenalectomy has become the standard of care for nonfunctional and functional adrenal tumors, including pheochromocytoma. With increasing laparoscopic experience and expertise, laparoscopy has been applied to larger lesions and in some cases to adrenal malignancy, both primary and metastatic. Yet laparoscopic adrenalectomy remains an advanced laparoscopic procedure and can be associated with high-grade complications when performed by the inexperienced.[6] Even in the busiest centers, performing more than 10–20 adrenalectomies per year would be considered "high volume." Concentrating these cases among a small number of surgeons would seem to make sense if volume does indeed correlate with improved outcomes.

That being said, we must keep in mind that there are a multitude of factors that play into specific outcome measures that go well beyond technical expertise and volume. For instance, it has been concluded that patients who undergo complex surgery in high-volume hospitals are likely to have a shorter postoperative length of stay. Although this may be true for certain procedures, does that one parameter really mean that those patients actually received "better" care than patients treated in a low-volume hospital? Smaller hospitals likely face constraints on early discharge that may not be a factor in larger institutions. These include limited resources (ancillary services, such as social workers, physical therapists, discharge planners, nursing staff to expedite early discharge) and perhaps limited local options for subacute posthospital care. In my institution, we have the luxury of having a home-care service and a rehabilitation hospital on the grounds of our main hospital. These factors have translated into efficient systems of care that expedite and facilitate the rapid transfer of patients out of the acute care setting, and hence may serve to improve length of stay. This may be not true for many smaller hospitals where resources are less abundant and clinical pathways for early discharge have not been established for less common diagnoses.

High volume, in and of itself, does not provide a guarantee of high-quality care. The use of a multidisciplinary approach has become increasingly critical to success in the management of complex surgical disease. For endocrine diseases in particular, collaboration between radiology, pathology, endocrinology, and surgical subspecialists can provide the foundation for optimal outcomes. Despite the increasing prevalence of adrenal lesions identified on axial imaging, adrenalectomy remains a relatively uncommon operation. The appropriate evaluation and management of patients with adrenal tumors requires a degree of expertise that may not be available in all institutions. In my opinion, the management strategy for these patients should include an emphasis on minimally invasive techniques performed by surgeons with an interest in adrenal surgery. Although an argument can be made that increased case volume may not always translate into improved quality of care, volume does seem to provide a reasonable surrogate for improved efficiency of care and may provide the basis for the development of clinical pathways and algorithms that have the ability to improve outcomes.

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