

# Impact of Residents on Operative Time in Aesthetic Surgery at an Academic Institution

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Aesthetic Surgery Journal  
Open Forum  
2019, Vol 1(4) 1–5  
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DOI: 10.1093/asjof/ojz026  
[www.asjopenforum.com](http://www.asjopenforum.com)

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## Abstract

**Background:** Duration of surgery is a known risk factor for increased complication rates. Longer operations may lead to increased cost to the patient and institution. While previous studies have looked at the safety of aesthetic surgery with resident involvement, little research has examined whether resident involvement increases operative time of aesthetic procedures.

**Objectives:** We hypothesized that resident involvement would potentially lead to an increase in operative time as attending physicians teach trainees during aesthetic operations.

**Methods:** A retrospective cohort analysis was performed from aesthetic surgery cases of two surgeons at an academic institution over a 4-year period. Breast augmentation and abdominoplasty with liposuction were examined as index cases for this study. Demographics, operative time, and resident involvement were assessed. Resident involvement was defined as participating in critical portions of the cases including exposure, dissection, and closure.

**Results:** A total of 180 cases fit the inclusion criteria with 105 breast augmentation cases and 75 cases of abdominoplasty with liposuction. Patient demographics were similar for both procedures. Resident involvement did not statistically affect operative duration in breast augmentation ( $41.8 \pm 9.6$  min vs  $44.7 \pm 12.4$  min,  $P = 0.103$ ) or cases for abdominoplasty with liposuction ( $107.3 \pm 20.5$  min vs  $122.2 \pm 36.3$  min,  $P = 0.105$ ).

**Conclusions:** There was a trend toward longer operative times that did not reach statistical significance with resident involvement in two aesthetic surgery cases at an academic institution. This study adds to the growing literature on the effect resident training has in aesthetic surgery.

## Level of Evidence: 2



Editorial Decision date: August 12, 2019; online publish-ahead-of-print October 07, 2019.

Training surgery residents is a meticulous, time intensive, and costly enterprise.<sup>1-3</sup> This particularly applies to aesthetic surgery, which is an essential portion of a plastic surgeon's training as demonstrated by the ACGME's increase in aesthetic surgery requirements for residents.<sup>4,5</sup> Compared with other fields of plastic surgery, residents have reported lower confidence in certain aesthetic cases.<sup>6-8</sup> Aesthetic operations are unique for the reason that they are less likely to be conducted in the large academic hospital setting where residents primarily train.<sup>9-12</sup> The education for aesthetic surgery is often provided in outpatient

community surgical sites that focus on efficiency.<sup>13</sup> Adding residents into these practices requires the attending surgeon to dedicate time during their day to resident instruction. In return, residents assist with patient management

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including answering patient questions, documentation, and medication orders.

One continuing area of concern is the impact on patient safety when residents are present in the operating room. Past studies in various surgical specialties including plastic surgery have shown that resident involvement can increase case time by as much as 40%.<sup>1,14-17</sup> Increase in operative time is a known risk factor for postsurgical complications.<sup>18,19</sup> Research specific to aesthetic surgery is divided on residents' impact on patient safety outcomes.<sup>4,20</sup> It is crucial to understand the influence residents have on outpatient aesthetic surgeries, so as to devise ways to increase residents' competency without sacrificing patient safety and experience. The purpose of this study is to demonstrate the effect resident involvement has on operative time in index aesthetic surgery cases.

## METHODS

An Institutional Review Board (IRB) approved retrospective cohort analysis was performed on all patients undergoing the chosen index operations by two attending surgeons who perform aesthetic surgery at a single institution over a 4-year period. The Human Research Protection Office IRB at Washington University in St. Louis approved this study. Breast augmentation and abdominoplasty with liposuction were chosen as the index aesthetic surgery procedures under review. These cases were chosen because of their volume at the hospital and that they were performed by both of the chosen aesthetic surgeons. The operations were performed from May 2013 to May 2017. During this period, attending surgeons did not have any resident coverage while residents were at mandatory conference one day a week.

Data were obtained using the electronic medical record at this institution (MetaVision [Needham, MA]). Data collected included demographics (age, sex), operative time defined by surgery start time and surgery stop time, and resident presence. Surgery start time was designated as time of incision and surgery stop time as closure of last incision as noted in the nursing record. Resident presence was confirmed by the intraoperative dictation note or the nursing operative record. Exclusion criteria included multiple procedures done in the same operation and resident led cases.

Quantitative data were analyzed using the Fisher exact test and Chi-square test for continuous variables and reported as the mean, standard deviation, and confidence interval. A stepwise logistic regression was done adjusting for age and BMI to see the effect of resident presence on case duration. Significance was assessed as  $P$  value < 0.05. Data were analyzed using SPSS.

**Table 1.** Patient Demographics for Breast Augmentation Cases

	Attending only ( $n = 38$ )	Resident present ( $n = 67$ )	$P$ value
No. of females/males	38/0	67/0	—
Mean age, years	35.4	33.5	0.435
Mean BMI, kg/m <sup>2</sup>	21.1	21.6	0.224

**Table 2.** Patient Demographics for Abdominoplasty with Liposuction Cases

	Attending only ( $n = 10$ )	Resident present ( $n = 65$ )	$P$ value
No. of females/males	9/1	65/0	—
Mean age, years	37.5	44.0	0.977
Mean BMI, kg/m <sup>2</sup>	25.5	28.2	0.999

## RESULTS

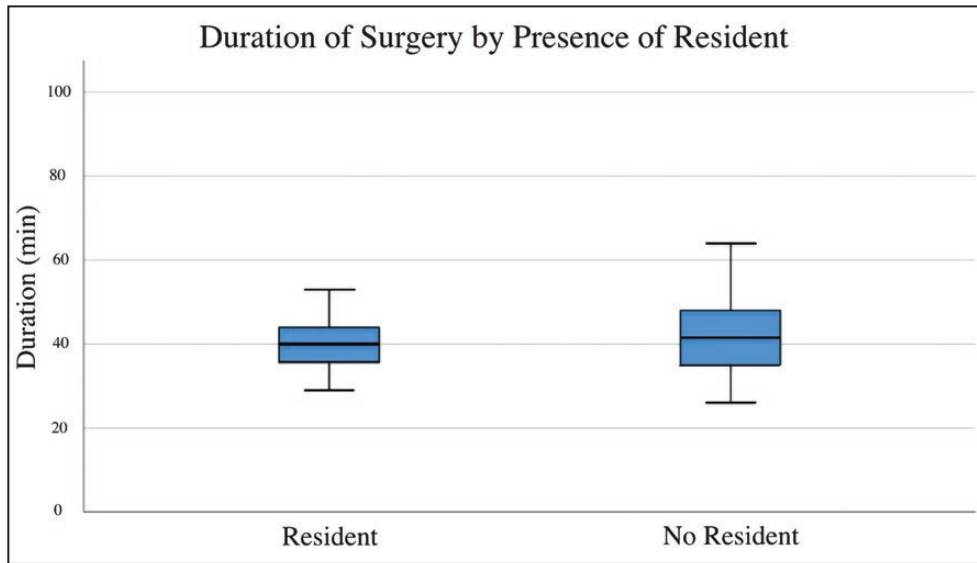
A total of 180 cases fit the inclusion criteria: 105 breast augmentation cases and 75 abdominoplasty with liposuction cases were analyzed. Patient demographics were similar for both procedures (Tables 1 and 2), and 27% ( $n = 48$ ) of operations were performed by the attending surgeon alone.

Of the breast augmentation procedures, 63.8% ( $n = 67$ ) of cases had resident involvement. Average operative duration with attending surgeon only was 41.8 min with a standard deviation of 9.6 min (95% CI: 38.7–44.8). Resident presence increased operative time to a mean of 44.7 min with a standard deviation of 12.4 min (95% CI: 41.8–47.7). Figure 1 demonstrates these data. A stepwise logistic regression with adjustment for age and BMI did not show a statistically significant difference in average case time with resident involvement ( $P = 0.103$ ).

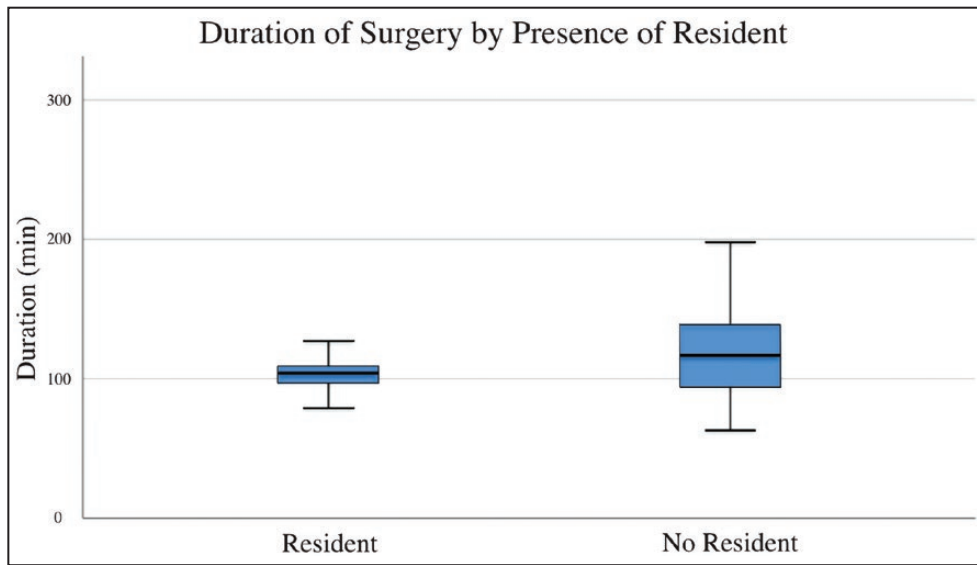
A total of 75 cases of abdominoplasty with liposuction were reviewed. 86.7% ( $n = 65$ ) of cases had resident involvement. Average operative duration with attending surgeon only was 107.3 min with a standard deviation of 20.5 min (95% CI: 94.6–120.0). Resident presence increased operative time to a total of 122.2 min with a standard deviation of 36.3 min (95% CI: 113.4–131.0). These data are represented in Figure 2. A stepwise logistic regression with adjustment for age and BMI did not show a statistically significant difference in average case time with resident involvement ( $P = 0.105$ ).

## DISCUSSION

Surgical training programs need to take into account what is best for their residents' education without sacrificing



**Figure 1.** Box and whiskers plot of breast augmentation surgeries displaying the difference in operative time between attending only cases vs cases where residents were present. Outliers defined by being more than  $1.5 \times$  the interquartile range less than the first quartile or greater than the third quartile were excluded from this depiction.



**Figure 2.** Box and whiskers plot of abdominoplasty with liposuction cases displaying the difference in operative time between attending only cases vs cases where residents were present. Outliers defined by being more than  $1.5 \times$  the interquartile range less than the first quartile or greater than the third quartile were excluded from this depiction.

patient safety and outcomes. Many current programs include a combination of didactics, hands-on operating room experience, and resident run clinics. While didactics conveniently teach more residents with fewer required patients, past research has stressed the importance of intraoperative experience.<sup>14,21</sup> Moulton *et al.* demonstrated the benefit of distributive learning, where shorter lessons over a course of time led to superior retention of skills compared with one long teaching seminar.<sup>22</sup> Resident run clinics provide this form of distributive learning, but

require previous operating room experience if residents are to operate independently. When surveyed, half of program directors felt that  $> 10$  cases were needed for a resident to confidently and safely execute a case.<sup>6</sup> To achieve sufficient case quantity, residents require early operating room experience.

The field of aesthetic surgery differs from other plastic surgery specialties in the fact that most operations are performed in an outpatient setting.<sup>8-10,12,13</sup> Patients electing for cosmetic procedures are paying for the expertise of the aesthetic surgeon

and often desire a private environment.<sup>10-12,23</sup> These characteristics do not align well with having a less experienced resident conducting part of the surgery. Outpatient aesthetic surgeons who partner with academic centers need to weigh the risks and benefits of training residents in their practice. Examples of benefits include assistance with patient administration work and call coverage.<sup>15</sup> If two operating rooms are available, surgeons can also cut down time in between cases if a resident is able to prepare the next patient as the surgeon finishes up the previous case. Potential risks include decreased patient satisfaction, safety concerns, and loss of time. Li *et al.*'s survey showed that patients' satisfaction with their physician's communication did not change when plastic surgery residents were involved in their care, unlike some other surgical specialties.<sup>24</sup>

Previous research is mixed on the effect residents have on complication rates in plastic surgery cases.<sup>4,18,20,21,25</sup> A previous study at our institution has shown resident aesthetic surgery cases to have similar complication rates to attending cases.<sup>4</sup> Research by Patel *et al.* and Sebai *et al.* has also shown similar complication rates in plastic surgery cases when residents are present.<sup>21,25</sup> A research study by Jordan *et al.* did find a significant difference in morbidity, but not mortality or overall complications with resident involvement in plastic surgery operations. Their study excluded aesthetic cases, and they also found an increase in operative time and discussed how this could play a part in their findings.<sup>18</sup> Malyar *et al.* looked at a large database of body contouring procedures and found higher 30-day surgical morbidity and thromboembolic events along with longer operating time when residents were present. Their research included a broader range of aesthetic procedures, but was not able to separate out surgeries performed in hospitals vs surgical centers. They also discussed that their average increase in operative time was 8.8 min, and whether this was clinically significant.<sup>20</sup>

Our research addressed the risk of increasing case time and found a trend toward longer operative times that did not reach statistical significance for two index aesthetic surgeries. To the best of our knowledge, there are few studies regarding resident impact on operative time in aesthetic surgery.<sup>20</sup> Studies in other surgical fields including reconstructive cases have found increased operative time when residents are present.<sup>3,14,15,25,26</sup> Despite the lack of statistical significance, the average surgical case time in our study was 2.9 min longer in breast augmentation cases and 14.9 min longer in abdominoplasty with liposuction cases when residents were part of the operation. Allen *et al.* and others have studied the cost of this increased operative time. Per their calculation, each minute of operating room time cost US\$9.57 even before considering increased anesthesia and other costs.<sup>3</sup> At this rate, even these small differences in time can make a large financial impact. This monetary cost is another factor aesthetic surgeons must weigh in when they are training residents.

There are several possible explanations for our study's results. Aesthetic surgery attendings are likely diligent and motivated to finish cases efficiently while helping residents throughout the case. They may have developed methods to lessen residents' impact on operating time, such as limiting their involvement or working simultaneously. This study is unable to specify the extent of resident involvement in the case based on the surgical record. Dull *et al.*'s research with general surgery residents was able to separate out cases where residents performed > 50% of the case and found a 15%–25% increase in case time.<sup>15</sup> In both of the index cases chosen for this study, there is the opportunity to work simultaneously on two surgical sites. The attending surgeon may teach on one side, while the resident replicates the procedure on the other side.

Limitations of this study include that it is retrospective in nature, and that it is limited to two index cases and two surgeons at one institution. It is difficult to quantify the resident involvement in a case by case basis. This can vary based on resident training level, experience with the surgery, and the attending surgeon's schedule for the day. The resident's training level was not able to be included in this study, but residents tend to rotate through performing these aesthetic cases at a similar point in their training. While our study controlled for patient age and BMI, other baseline characteristics could have differed between cases. Residents tend to be brought into more complex cases as these are rarer teaching experiences, and these cases may have an inherently longer operating time.<sup>18,26</sup> As a previous study at our institution demonstrated similar complication rates between resident and attending aesthetic cases,<sup>4</sup> we chose to focus this study on the primary outcome of operative time and did not perform additional analyses on complication rates.

Future research could focus on controlling for resident level of training as well as expansion of this study with multicenter data and for more aesthetic cases. Some past research has found that inexperienced residents have a greater impact on operating time.<sup>2,14</sup> Others support the opposite view that more senior residents are allowed to participate more, which further increases operating time.<sup>1,16</sup> Future studies could also review combination cases with several procedures in one operation and facial aesthetics which continue to be an area where trainees feel less comfortable.<sup>7</sup>

## CONCLUSION

Plastic surgery residents receive a multitude of benefits from being involved in aesthetic surgery cases during training. Early active participation allows them to partake in resident run clinics and increase their aesthetic surgery case load.<sup>9</sup> This is imperative since the ACGME's increase in aesthetic surgery graduation case requirements in 2014.<sup>5</sup> It is also necessary to stay competitive with other fields

such as otolaryngology, dermatology, and ophthalmology who also receive aesthetic training.<sup>7,8,13</sup> At an academic institution, it can be difficult for plastic surgery trainees to accumulate confidence with the limited number of aesthetic cases. While it is important for residents to feel comfortable performing aesthetic procedures by the end of training, those doing the training must consider the impact on operating time, safety, and patient satisfaction that is still being actively expanded upon in the literature. Training confident plastic surgeons is essential to continue current advancements in aesthetic surgery.

## Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

## Funding

The authors received no financial support for the research, authorship, and publication of this article.

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