Letter to the Editor

Good Tidings of Landmark Lipoplasty Study Troubled by Statistical Ambiguities

To the Editor:

The ASAPS survey updating statistics on lipoplasty complications bears good tidings: the safety of lipoplasty has improved substantially since the dismal findings of the 1997 American Society of Plastic and Reconstructive Surgeons (ASPRS, since renamed ASPS) Joint Lipoplasty Task Force and the 1994-1998 Grazer and de Jong survey reports. That gratifying message stands unchallenged. It is in the gritty details of quantifying “substantial improvement” that questions arise, for the report’s numbers neither add up properly nor are they complete.

At the root of the paradox lies nondisclosure of the basic incident counts; from these raw numbers statisticians calculate ratios and percentages. That troublesome omission cropped up when I tried to reconstruct fatality counts from the tabulated data; anomalous non-integer numbers resulted. Clearly, something was amiss. This prompted my inquiry to the author, who consulted with the project’s statistician.

It turns out that, although the 754 questionnaires returned to the contractor collectively spanned 94,159 lipoplasties, nearly one quarter (24%) of these entries were discarded during subsequent numeric processing because of incomplete or incorrect subcategorization (personal communication [e-mail], July 24, 2001). Therefore, the survey’s mortality statistics actually are based on 71,717 cases, rather than on 94,159 cases. As that vital detail was not shared with the author, it was not disclosed in the report or incorporated in the tables.

To compound the statistical ambiguities, we still remain in the dark about (1) the number of ASAPS respondents corresponding to these 71,717 cases (certainly fewer than the 754 cited), and (2) the exact number of fatalities reported to the survey contractor in the original questionnaire returns. The latter number (ie, deaths per 94,159 cases) is the numerator for calculation of the factual mortality rate, which in turn would permit proper apples-to-apples comparison with the previously cited earlier surveys.

All well and good; an Erratum notice in the Journal to correct these omissions would easily have set the record straight. However, that is not the end of the issue. A recomputation of fatality counts from the revised population data, as I had done earlier, yielded a total of 71,886 cases (last cell in Table): an overcount of 169 cases more than the 71,717
case cohort. Either the revised case count itself is not correct, or the fatality rates were calculated after further unspecified case deletions had been applied.

Moreover, the 2 low-incidence (1/47,619) nonfatal complications listed in Table 2 of the report (“cannula perforation” and “lidocaine toxicity”) make no mathematical sense. That ratio must correspond to either 1 occurrence per 47,619 cases or 2 per 95,238 cases. As the survey yielded no more than 94,159 entries, the latter condition cannot hold true; but neither can I figure out where to fit the former 47,619 cases into the tabulated totals or subtotals.

Finally, 2 comments: (1) The findings are based on results from an authentic census survey because all then-current ASAPS members were queried. By eliminating the uncertainties and assumptions inherent in random sampling, a census survey gains substantial statistical robustness. (2) Rather than presenting arcane 4–decimal-place fatality percentages, the more expressive statistic is incidence per 100,000 population. After all, a mortality rate of 2.1/100,000 is easier to visualize than is 0.0021%.

It is a pity that the profound insights gained from this landmark survey had to be marred by statistical flaws of omission and commission. The author is to be congratulated for demonstrating significant improvements in patient safety resulting from massive educational efforts by the professional societies.

Rudolph H. de Jong, MD
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References


Dr. Hughes’ reply:

Dr. de Jong demonstrates impressive numeric detective work. The excess of 169 procedures, however, is not a miscalculation; the excess results only from adjustments to accommodate respondent inconsistencies in completing the questionnaire.

The questionnaire was mailed initially to 1432 Society members, and 754 responded. The response rate is about 53%, which is certainly encouraging. The questionnaire was fairly long and required detailed responses to intricate questions. As is often the case with such surveys, response patterns were not always internally consistent.

Question 15 asked the respondents to provide (a) the number of lipoplasty procedures in the last 24 months and to break down this figure into the following:

(b) The number of procedures with lipoplasty only.

(c) The number of procedures with lipoplasty done together with abdominoplasty.

Table. Mortality rate of combination procedures

<table>
<thead>
<tr>
<th>Procedure(s)</th>
<th>Fatality rate</th>
<th>Deaths</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipoplasty alone; no other procedure(s)</td>
<td>1/47,415 (as published)</td>
<td>1 (E-mail)</td>
<td>47,415 (E-mail)</td>
</tr>
<tr>
<td>Lipoplasty plus other surgery (excluding abdominoplasty)</td>
<td>1/7314 (as published)</td>
<td>2 (calculated)</td>
<td>14,628 (calculated)</td>
</tr>
<tr>
<td>Lipoplasty plus abdominoplasty (&amp; other)</td>
<td>1/3281 (as published)</td>
<td>3 (calculated)</td>
<td>9843 (calculated)</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1/11,981 (computed)</td>
<td>6</td>
<td>71,886*</td>
</tr>
</tbody>
</table>

*The revised case count as used for numeric analysis (personal communication [E-mail], July 24, 2001) was 71,717; the 94,159 cases cited in the ASJ report represent the original raw returns. Reverse engineering the number of deaths (3rd column) from the fatality rates (2nd column) yields a total of 71,886 lipoplasties, 169 procedures in excess of the above case count of 71,717.
(d) The number of procedures with lipoplasty done without abdominoplasty but with some other procedure.

Of the 754 respondents, 66 gave response of zero to part (a). Of the remaining 688 (754 – 66 = 688) respondents, there were 162 for which the responses to (b), (c), and (d) were either missing or failed to come within 10% of the response to part (a). The remaining 526 (688 – 162 = 526) respondents were used in making the calculations related to this question. This resulted in the following data:

- 71,717 procedures in all, for (a).
- 47,415 procedures for (b).
- 9,843 procedures for (c).
- 14,628 procedures for (d).

Because the threshold for consistency was set (admittedly, subjectively) at 10%, this is an imperfect breakup; note that 47,415 + 9,843 + 14,628 = 71,886. The difference of 169 (71,886 – 71,717 = 169) is precisely the value noted by Dr. de Jong. Had the threshold been more stringent than 10%, fewer procedures would have been used.

The numerators for the death rates were small integers and were not in doubt; these numbers do, in fact, correspond to the figures for “deaths” noted in Dr. de Jong’s table. The denominators for the death rates had distortions created by allowing responses for which the (a) value was not exactly equal to (b) + (c) + (d). The excess of 169 procedures, out of more than 71,000, is very small and does not have material impact on the calculations.

One can legitimately claim, of course, that all such details should have been provided in the article. This omission was in no way intended to misrepresent the data.

Difficulties of this sort were encountered in other questions as well. Every calculated rate was based on the maximum quantity of credible information, and this differed among the questionnaire items. A respondent who was disqualified from question 15 above might still be part of the tallies for other questions.

Certainly the report could have contained all the details by which responses were screened for consistency. However, this would have resulted in a much longer presentation, and the report would have been replete with ancillary information not related directly to the fundamental questions.

Dr. de Jong notes that the findings should be considered as a census rather than a random sample in that all then-current ASAPS members were queried. This is so, but the nonresponse of about 47% of the members places a random mechanism on top of the census. The net effect is a sampling process not within our control.

Finally, Dr. de Jong would prefer rates expressed as incidence per 100,000. This is a very reasonable suggestion, and certainly “2.1 per 100,000” is easier to read than “0.0021%.”

I am hoping that it is clear from context that all numeric findings were based exclusively on the questionnaire. The numbers are reasonable to the extent that the responses were representative and correctly reported.

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