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Discussion

Dr Franca M. A. Melfi *(Pisa, Italy)*. This study is interesting, and to my knowledge, it is also the largest series published. When we look at the literature today, we find similar articles with similar results except regarding the margins, which are really interesting.

When I see those slides, I note that the MIS group was associated with a higher 30-day readmission rate than the open group. I see that the patients with stage III compared with stage I thymoma and the patients with the largest tumors were less likely to receive a thymectomy by a MIS approach. Also, I see the data relating to the MIS are reported as a single datum, including VATS and robotic surgery, although the technical technique implies a different technology with different sutures in terms of addition of instrumentation and other things that are important because they influence clinical outcomes. I would like to know if you consider this aspect, and if no, don't you think that a further analysis related to these data should be done?

Dr Chi-Fu Jeffrey Yang *(Stanford, Calif)*. Thank you, Dr Melfi. With regard to your first question with readmission, in the propensity score–matched analysis, there was no significant difference in readmission between open and MIS approaches.

One of the things we did do in the manuscript—we didn't have time to show it for the presentation—was to look only at stage I and II disease. The analysis is presented in the manuscript.

We also looked at outcomes, in an exploratory analysis, for just the stage I patients, just the stage II patients, and just the stage III patients. We found that, for each of these subgroups, there were no significant differences in short-term outcomes and overall survival between open and MIS approaches. With regard to VATS versus robotic, we didn't look at that formally in the paper—we felt it was probably beyond the scope of the paper—but we did do an exploratory analysis, propensity matched, of 77 patients in both groups and did not find any significant difference between VATS and robotic with regard to the short-term outcomes we presented and with regard to overall survival.

Dr Joshua Robert Sonett *(New York, NY)*. Excellent data review and presentation. With this database with thymoma, can you think of any conceivable result where you would have shown a survival difference given the pathology that we are dealing with here? So let's say without knowing disease-free recurrence, almost all these patients, even if they had seeded their pleura, would still probably be alive, especially by a retrospective national database. That's my first question. What do you think?

Dr Yang. To your point, I cannot see any possible situation. I think that follow-up is an important issue. The literature for minimally invasive thymectomy is still growing and most studies do not have true long-term follow-up. The longest follow-up we could find was a JART study of 4.4 years, and our median follow-up is around that time. As you are alluding to, the nature of thymoma is indolent, and recurrences can happen anywhere from 2 to 10 years, as a recent JART study showed.

Dr Sonett. It is a word of caution for all of us. You take a completely curable disease and make it close to incurable or difficult to cure if we violate the capsule or perform an incomplete resection, for example, the survival is the same at 10 years, especially from a retrospective database, and you are expecting Medicare to catch nodules on the diaphragm at 7 or 8 years when these patients were probably lost to follow-up. I think it is dangerous to say

the survival is the same no matter how we do it. I perform MIS all the time, but for all of us, we have to be careful and honest with ourselves when we are doing it, no-touch technique, in regard to the thymoma, and have a zero tolerance to putting patients at risk for something that they are going to do well with no matter how you do it, open or VATS or robotic or subxiphoid, whatever you are trying that week. We just can't hurt the patient when we know we can have a 100% cure. I would say you have caveats in your article to make that clear that survival is not a surrogate for knowing if we did our surgery appropriately and safely.

Dr Yang. Absolutely. For the manuscript, we tried to be careful with the language and not to overstate the significance of our findings. Specifically, we have avoided referring to the survival data presented in our study as ''long-term'' survival.

Dr Frank C. Detterbeck *(New Haven, Conn)*. Did you adjust for stage in your multivariate analysis in light of this study?

Dr Yang. Yes, we did.

Dr Detterbeck. Okay, good. The 14% R1 resection rate is extremely high. What do you think about that? That surprises me.

Dr Yang. In terms of R0 resections, in the literature it ranges from 40% to 100%. This is quite a large range for open and for minimally invasive. We speculate that one reason why our R1 resection rate was much higher than the ITMIG study, for example, where they had over 94% R0 resections for the MIS group, may be because of a coding issue. In the National Cancer Database, registrars have to input the data using available pathology reports. There could be situations in which, in the pathology report, negative margins were incorrectly coded as positive. For example, in the case of a thymoma, if a specimen extends to the margin, it doesn't always mean the margin is positive. The tumor may simply be extending into the air of the pleural space. However, the pathology report may have reported a positive margin simply because the tumor wasn't bordered by normal tissue. These issues would have been clarified by the surgeon, but the clarifications may not have been reflected in the pathology report. Of note, the registrars will use whatever the final pathology report says and input that result into the database. An alternative explanation is that there are just worse outcomes in the US but we speculate that the more likely reason for the differences seen in R1 resection between our study and other studies such as those by ITMIG is due to differences in coding methodology.