

## Discussion

### Presenter: Dr Hiroo Takayama

**Unidentified Speaker 1.** Okay, the invited discussant for this is going to be Maral Ouzounian.



**Dr Maral Ouzounian** (*Toronto, Canada*). It's my privilege to discuss this paper today. Your group has reported the early results of more than 1100 patients undergoing elective proximal aortic repair at Columbia University over a 15-year period. Results were excellent, with an overall mortality of 1.5% and stroke of 2%, although the risk of death and stroke increased to 4% and 9.5% respectively in the distal extension group. Partial or total arch replacement was associated with a 2.9-fold increased risk of death or stroke on multivariable analysis. I would like to congratulate the authors for reporting the contemporary results of elective proximal aortic repair at a tertiary care center. They wisely excluded acute dissections, endocarditis, emergency procedures, and concomitant surgery other than aortic valve interventions. By keeping the study cohort fairly homogenous, they have highlighted the outcomes after elective isolated proximal aortic repair and the independent predictors of adverse events. I also appreciated that they looked not only at stroke and death but also at a composite end point of adverse events after surgery.

I have a few questions for Dr Takayama. I'll start with the most striking finding, that proximal extension into the root was not associated with increased risk, but distal extension was. This finding contradicts previous reports in the literature by several groups who found no increased risk with the addition of a hemiarch procedure. Intuitively, adding a total arch to a root replacement would increase perioperative risk, but your proximal and distal combined group had a very low rate of adverse events. So what do you think accounts for this increased risk with distal extension aortic repair in your study compared to other reports in the literature? You did not report circulatory rest times or nadir temperatures at which circulatory rest were performed. Were these accounted for in the analysis? Did patients undergoing a total arch replacement receive bilateral ACP? Perhaps you could hypothesize as to why this increased risk was observed and briefly describe your approach to brain protection and how it has evolved over the years.



**Dr Hiroo Takayama** (*New York, NY*). Thank you Dr Ouzounian for closely examining our abstract while you are extremely busy taking care of your patients with Coronavirus Disease 2019 in your hometown, Toronto. Your questions are to the point. We totally agree with you that some of our

findings are actually surprising to us as well because the previous literature shows that adding at least hemiarch does not really change the risk. I think, however, our study is uniquely equipped with a strength over the previous studies because we have a larger sample, and event rates are higher because we chose these combined end points. Together, I think—no, we believe it allowed identifying a small, but important, significant difference. Clinically, it's an important difference among the procedures. Also, as to the reason of this worse outcome in the distal group, which is perplexing, I must admit that it seems to make sense that the larger operation results in worse outcome. We cannot agree more that examining the detail of these arch procedures in an attempt to understand why this outcome is worse is critical. For this study, we did not account for the variables associated with circulatory rest or cerebral protections because these measures are not available from the arch replacement, and therefore, the collinearity was too much for the further statistical analysis. Just briefly talking about our strategy for the arch surgery, we don't routinely check the circulatory rest. And hemiarch is typically performed with unilateral cerebral protection, and total arch is usually with bilateral. Both are usually with moderate [inaudible]. In earlier years, we used to use axillary cannulation, but now we more frequently use central cannulation.

**Unidentified Speaker 1.** It was a great response, but in addition to what Maral pointed out having to do with mortality and stroke, in your distal extensions, you also had a significantly increased respiratory failure problem. I was wondering if you looked into issues that are associated with that in arch replacement such as recurrent laryngeal nerve and blood transfusion.

**Dr Takayama.** That's an excellent point. Again, we couldn't really separate out the reason for that, but certainly, many of our composite end points—difference of our primary end points, which is composite end points, the differences are driven by mostly respiratory failure and acute renal injury. I totally agree that the prolonged ventilator time is the problem of these arch procedures compared with the root or ascending, and as you pointed out, the mechanical issues that are unique to the arch surgery, such as recurrent laryngeal nerve. We are doing a separate project examining those mechanically important complications uniquely associated with arch surgery. In that preliminary data analysis, we didn't find a difference, for instance, vocal cord injury or prolonged ventilation due to phrenic nerve or paralyzed diaphragm and so forth. Instead, what we found was that, simply, these patients are on the ventilator for a longer period of time. Perhaps that's related to the nature of circulatory rest, at least in our hands. Or we are wondering

whether that may be related to the fact that other, more routine [inaudible] patients, if they are ascending or root patients, are treated similar to coronary artery bypass grafting valve patients under the fast track.

**Unidentified Speaker 1.** I'd be interested and look forward to your further analysis to sort out whether it's a technical problem or if it's a patient selection comorbidity issue. But to stay on time, we have to move on.