Dr Park: The longest we have followed must be around 10 years.

Dr Dusmet: So you followed all these patients up until now?

Dr Park: Yes.

Dr M. Goettesy (Norfolk, VA, USA): Dr Park, yours is probably the world’s largest experience. Coming from Norfolk, the wonderful thing about the Nuss procedure is that recurrence is very rare. Most of our recurrences were in the first 10-year experience, and when you really look at the data, all of them were in the younger kids. Now, those were also the kids in whom we were taking the bars out before 2 years, and we really only had two recurrences in the last 1000 patients, and all of those were, again, in kids less than 13 years old. The real question concerns the long-term follow-up. Even though it may not be statistically significant, the kids you do at 3 and 4 are going to have a slightly higher recurrence, and you’re going to need to follow them for probably 15–20 years. The question I have is, in the really small kids, 3 and 4 years old, are there any wound issues? Even the small bars are fairly large for some of the small children at that age. And then, more importantly, at least in the USA, there’s a big difference between doing a 6-year-old or 7-year-old from the emotional standpoint of tolerating a painful procedure, and when they have it done at 11 and 12 years. Most of these kids are running around with no symptoms, and that has been our policy; they may have a severe pectus, but with the little 6- and 7-year-olds who are running around with no problems, there’s really no harm in waiting until they are 11 and 12 when their chest is still flexible, malleable, and you have all the benefits you’ve stated.

Dr Park: You might have longer follow-up than me, so you may answer that question better than me. For young patients around 3 or 4 years of age, I think we can place the 9-inch bar in those patients. I think that’s a very good size bar and they can tolerate the procedure very well. Actually, they have less pain and fewer complications and complaints because they are very young. They are more malleable for everything. So I think at the age of 3, we can do well with the procedure. Actually, those patients are almost the same as the 6-year-old and 7-year-old patients. So we can do it after 3 years of age safely and effectively.

Dr J.R. De Campos (São Paulo, Brazil): You have a huge experience. I’m really afraid about the asymmetric transformation in patients with pectus excavatum. That’s my only concern in the presentation. We have less than 20% of your experience, and I had to reoperate on two of my patients. So this is my concern. How do you deal with that if this happens in the follow-up period? We noticed that if we follow the patients, you can have asymmetric transformation in these young patients. If it happens with your patients, how do you deal with it?

Dr Park: I really don’t understand your point. My notion about the asymmetric transformation is that the deformity is shifting towards the right side over time, so we have to repair early to avoid asymmetric transformation. That’s my message.

Dr De Campos: But in this case you have asymmetric transformation in young patients, and then you could transform an excavatum deformity into a carinatum. If this child continues to grow, the asymmetrical part grows into the front, and then maybe you could transform an excavatum pectus into a unilateral pectus carinatum. That’s my concern. Do you understand?

Dr Park: I’m not transforming the excavatum to a carinatum. I’m repairing the excavatum. My asymmetric bar technique just elevated that depression, not touching any other area which is normal. So that’s the main idea of the asymmetric bar technique to avoid any further elevation on the normal side.

Dr De Campos: I agree with you dealing with young patients less than 10 years during the first years of follow, but I would like to hear about follow-up 5–10 years after the surgery of these asymmetric patients.


MINIMALLY INVASIVE OR MAXIMALLY INTRUSIVE

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The article by Park et al. ‘How early can we repair pectus excavatum: the earlier the better?’ [1] is a question within a question which confronts the practitioner like a Russian nesting-doll. Is the repair of pectus excavatum appropriate in young children? Has the procedure, identified as ‘minimally invasive’ [2], become today’s method of choice for the repair of pectus excavatum? Should it be used in the very young?

The issue of timing of the correction of pectus excavatum generated quite a flurry in the professional literature in the 1990s. Milovic, Oluic [3] and Haller et al. [4] called attention to a group of patients who, after the surgical correction of their pectus excavatum anomaly in their early childhood, prior to becoming adolescents, developed restrictive thoracic dystrophy, a condition characterized by a narrow torso, a small immobile and ‘peaked’ anterior chest wall, horizontal ribs and breathing difficulties of various degrees. They postulated that the development of this condition, also referred to as ‘acquired Jeune disease’, was due to the fact that these patients were operated on before the age of 4 years [3, 4] and recommended that the repair of pectus excavatum should be delayed until they became teenagers. In our view, the problem with these patients was not that they were operated on too early, but that the surgical technique was faulty, i.e. a too radical resection of the costal cartilages and extirpation of the growth plates, both which interfered with the future growth of the thoracic cage. We have proven in our clinical material that with an appropriate surgical technique, which includes conservative cartilaginous resection and the preservation of the growth centres, the correction of pectus excavatum may be safely performed even in the very young [5].

The present question is whether experiences gained in open pectus excavatum repair be applied also to the Nuss operation? While the Nuss procedure does not involve the resection of the cartilages, the transfixion of the anterior chest wall with rigid
metal bars may indeed cause the same damage as the over-radical open operation, by restricting growth and expansion. Neither Park nor any other authors have addressed this concern.

One is also obliged to raise the issue of the indication for the Nuss operation in general and its appropriateness in the very young in particular. It needs to be realized that the Nuss procedure is not only not ‘minimally invasive’ but it is ‘maximally intrusive’. Using the now outmoded ‘classic’ Ravitch operation [5], which is performed through a long vertical incision and leaves the sternum unsupported as a control group, is simply unacceptable. The modern modifications of the ‘Ravitch’ are performed through a 5–6-cm (albeit anterior) exposure, use permanent substernal mesh support and do not need reoperation. If done properly, complications are rare and the results are excellent [6]. The Nuss operation on the other hand involves passing massive metal rod(s) through both pleural cavities and through the narrow sternopericardial space and leaves them in place for extended time periods after which the removal requires a second intervention. Complications are frequent and occasionally deadly, and vary from cardiac and pulmonary lacerations to mediastinitis and a paralyzed diaphragm, sequelae seldom, if ever seen with open repair. Even if the perioperative course of the Nuss procedure is uneventful, the danger of complications, especially the dislodging of the bar and perforation of vital organs persist as long as the bars are left in place. The adult patient, at the very least, has the sense of trying to protect his chest transfixed with a steel bar overlaying his heart. A young child does not. It is doubtful whether the Nuss operation should be used at all. It is even less certain whether it should be applied in the very young.

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