

## JOURNAL CLUB SUMMARY

8/25/04 - Pectus Excavatum

(attendees: Breuer, McKee, Moss, Tashjian, Silverman, Otake, Toset, Kennedy, Brennan, Goyal, Henry, Walker, Gruenbaum)

- I. Fonkalsrud EW, Dunn JCY, Atkinson JB. Repair of pectus excavatum deformities: 30 years of experience with 375 patients. *Annals of Surgery* 231:443-448, 2000.

Presented by Leo Otake, MD

Reported	Not App.	REPORTING DETAIL – METHODS SECTION	Comments
Yes		A clear description of study design	Case series
Yes		The number and practice type of institutions where cases were performed	Single institution
Yes		Number of surgeons who actually operated in study	1 surgeon operated on 336 patients
Yes		A statement as to whether the same surgeon operated on pts from different treatment groups or just one group	Only one group, mostly one surgeon
Yes		The precise timeline during which patients were treated	1969 - 1999
Yes		A clear description of how patients were selected into study	Criteria given for which patients received an operation
Yes		The number of eligible patients at the study sites excluded during the study	375 pts followed
Yes		A clear description of the study population	Age, severity score range and associated anomalies reported
Yes		A clear description of the relevant diagnostic criteria used to identify cases	Two modalities used - CT and plain films. Used Haller criteria for severity.
Yes		A clear description of critical aspects of operative technique and peri-operative care	“modified Ravitch technique” on all pts
Yes		Statement as to whether any attempts were made to standardize operative technique or peri-operative care	Mostly done by one surgeon
		<b>RESULTS</b>	
No		Appropriate measures of central tendency of all relevant demographic and baseline variables	Age range 2.5-53 yrs given
Yes		Range and median for length of follow-up reporting	3 mo to 30 yrs, mean 12.6 years
No		Relevant outcome variables are presented with appropriate measures of range and variability	Subjective outcomes about exercise tolerancem stamina, asthma
Yes		Methods for measuring outcomes of interest are clearly described	“exercise tolerance” subjectively, xray findings also subjective, subjective measure of asthma improvement
No		Statement is made whether any data is missing (and how missing data is addressed)	
Yes		Number and appropriate details regarding all complications	Seroma, pneumothorax, pneumonitis and effusion

Summary: This paper presents the largest consecutive series of patients who have undergone a Ravitch procedure for pectus excavatum.

Results summary:

Table 1: Age range of included patients

Table 2: Associated disorders of patients

Discussion: This study reports the experience of largely one surgeon at a single institution. It is useful in showing that the technique can be used to achieve subjective improvement in symptoms. Given that is the experience of one institution and one surgeon with a lot of experience, this is not generalizable to the outcomes that will be achieved by the regular pediatric surgeon.

More objective measures of asthma, pulmonary function tests, and exercise tolerance would be useful to objectively quantify the effectiveness of this procedure. Effort independent tests are necessary because of the impact on self image, morale on effort. This paper provides a baseline standard of the Ravitch procedure by a center dedicated to this procedure with significant experience in the procedure.

II. Croitoru DP, Kelly RE Jr., Goretsky MJ, et al. Experience and modification update for the minimally invasive Nuss technique for pectus excavatum repair in 303 patients. J Pediatric Surgery 37:437-445, 2002

Presented by David Tashjian, MD

Reported	Not App.	REPORTING DETAIL – METHODS SECTION	Comments
Yes		A clear description of study design	Case series
Yes		The number and practice type of institutions where cases were performed	Single institution
No		Number of surgeons who actually operated in study	Unclear though all trained by Nuss
	X	A statement as to whether the same surgeon operated on pts from different treatment groups or just one group	
Yes		The precise timeline during which patients were treated	1987 - 2000
Yes		A clear description of how patients were selected into study	608 evaluated, criteria for operation given, 303 pts operated on
Yes		The number of eligible patients at the study sites excluded during the study	See above - CT Haller index >3.5, PFTs show restrictive disease, MVP, murmur, or abnl rhythm on EKG, documentation of progression with sx OTHER THAN body image concerns, failed Ravitch or failed MIPR
Yes		A clear description of the study population	See table 1 demographics
Yes		A clear description of the relevant diagnostic criteria used to identify cases	CT scan, PFTs and cardiac evaluation after hx and pe
Yes		A clear description of critical aspects of operative technique and peri-operative care	Modified Nuss procedure explanation given
No		Statement as to whether any attempts were made to standardize operative technique or peri-operative care	No statement that standardized but detailed technique and care guidelines given and all trained by Nuss thus likely standardized
		<b>RESULTS</b>	
Yes		Appropriate measures of central tendency of all relevant demographic and baseline variables	Mean age and range given, median Haller score and range given
No		Range and median for length of follow-up reporting	
No		Relevant outcome variables are presented with appropriate measures of range and variability	
No		Methods for measuring outcomes of interest are clearly described	
No		Statement is made whether any data is missing (and how missing data is addressed)	
Yes		Number and appropriate details regarding all complications	Tables 2 and 3 present early and late complications

Summary: This paper presents a large experience of a single institution with the minimally invasive repair for pectus, commonly known as the “Nuss” procedure.

Result summary:

Table 1: Demographics of patients operated on (mean age 12:4, 4:1 M:F ratio, avg Haller index 5)

Table 2: Early complications listed (2.6% pneumothorax req. treatment, 60% incidental pneumothorax, 75% transient Horner's syndrome [w/thoracic epidural])

Figures 1-4: Pictures of modified instruments

Table 3: Late complications (9% bar shifting req. revision)

Table 4: Long-term results in post-bar removal patients (compares initial results with results after bar removal)

Table 5: Age at time of procedure

Discussion: Comparable to the first paper discussed, this is a single institution experience with a procedure with which they have considerable experience. It can stand as a standard which others can attempt to achieve in their experience with this procedure. Given the vast experience of this center and these surgeons, these results are not necessarily generalizable to the regular pediatric surgeon performing this procedure. They have tried to include some objective data in terms of indications for OR and changes post-operatively. However, there was no statistical improvement in PFTs post-operatively.

III. Molik KA, Engum SA, Rescorla FJ et al. Pectus excavatum repair: experience with standard and minimal invasive techniques. J Pediatric Surgery 36:324-328, 2001

Presented by Byron Kennedy, MD

Reported	Not App.	<b>REPORTING DETAIL – METHODS SECTION</b>	Comments
Yes		A clear description of study design	Retrospective comparison study between Nuss and Ravitch
Yes		The number and practice type of institutions where cases were performed	Single institution
No		Number of surgeons who actually operated in study	Not outlined
Yes		The precise timeline during which patients were treated	1995-1999
No		A clear description of how patients were selected into study	Unclear which pts got which operation
No		The number of eligible patients at the study sites excluded during the study	
Yes		A clear description of the study population	See table 1
No		A clear description of the relevant diagnostic criteria used to identify cases	
No		A clear description of critical aspects of operative technique and peri-operative care	
No		Statement as to whether any attempts were made to standardize operative technique or peri-operative care	
		<b>RESULTS</b>	
Yes		Appropriate measures of central tendency of all relevant demographic and baseline variables	Only for age, not for other baseline characteristics
No		Range and median for length of follow-up reporting	
No		Relevant outcome variables are presented with appropriate measures of range and variability	Averages given but no range or variability
Yes		Methods for measuring outcomes of interest are clearly described	
No		Statement is made whether any data is missing (and how missing data is addressed)	
Yes		Number and appropriate details regarding all complications	Complications described
		<b>IF MORE THAN ONE TREATMENT GROUP</b>	
Yes		Appropriate measures of central tendency and variability (ie. Median or mean and SE) of all relevant demographic and baseline variables	For age only
No		The range and median for length of follow-up reporting for each treatment group	
Yes		A precise timeline during which all patients were treated for each group	1995-1999
No		Outcome variables being compared between groups are presented with appropriate measures of variability (eg standard deviation)	
No		Measures of type II error (p-values) for comparison statistics are	

		presented with actual values if $p=0.01$ or larger (eg. $P=NS$ and $p<0.05$ are not acceptable)	
No		A description of how patients were selected into each treatment group	
No		A statement is made as to whether the same surgeons operated on patients from different treatment groups	
		<b>OVERALL ASSESSMENT</b>	
		Are the results of this study valid	
		What is the magnitude and precision of treatment effect (if a control group was used and this can be determined)	
		Are the results applicable to your patient population	

Summary: Observational retrospective comparison between two procedures. No definition of which patients got which procedure. There may have been significant selection bias between the two groups. Not a valid comparison since we do not know the differences between the two groups, why the patients got the surgery they did, and the experience of the surgeons with the two techniques may have been different.

Result summary:

Table 1: Comparison of two groups in demographics and outcomes

Discussion: This study can be used as a retrospective, observational study on the outcomes of these two groups of patients. Without more information as to how patients were selected for each procedure, it is difficult to truly compare the patients and the procedures. However, this study does present some results from a center that is doing both procedures and that is doing a volume more comparable to other centers in the US as compared to the centers in the first two studies which are high volume centers for these procedures.

IV. Fonkalsrud EW, Beanes S, Hebra A et al. Comparison of minimally invasive and modified Ravitch pectus excavatum repair. J Pediatric Surgery 37:413-417, 2002

Presented by Arnbjorn Toset, MD

Reported	Not App.	<b>REPORTING DETAIL – METHODS SECTION</b>	Comments
Yes		A clear description of study design	Retrospective comparison of two procedures at two different sites
Yes		The number and practice type of institutions where cases were performed	Two institutions
No		Number of surgeons who actually operated in study	
Yes		A statement as to whether the same surgeon operated on pts from different treatment groups or just one group	Ravitch at UCLA, Nuss at South Carolina
Yes		The precise timeline during which patients were treated	1996-2000
No		A clear description of how patients were selected into study	
No		The number of eligible patients at the study sites excluded during the study	
Yes		A clear description of the study population	Age, severity score described
No		A clear description of the relevant diagnostic criteria used to identify cases	“severity score” but no other criteria given
No		A clear description of critical aspects of operative technique and peri-operative care	
No		Statement as to whether any attempts were made to standardize operative technique or peri-operative care	
		<b>RESULTS</b>	
Yes		Appropriate measures of central tendency of all relevant demographic and baseline variables	Age and severity scores given
No		Range and median for length of follow-up reporting	
Yes		Relevant outcome variables are presented with appropriate measures of	

		range and variability	
No		Methods for measuring outcomes of interest are clearly described	
No		Statement is made whether any data is missing (and how missing data is addressed)	
Yes		Number and appropriate details regarding all complications	
		<b>IF MORE THAN ONE TREATMENT GROUP</b>	
Yes		Appropriate measures of central tendency and variability (ie. Median or mean and SE) of all relevant demographic and baseline variables	
No		The range and median for length of follow-up reporting for each treatment group	
Yes		A precise timeline during which all patients were treated for each group	1996-2000
No		Outcome variables being compared between groups are presented with appropriate measures of variability (eg standard deviation)	
No		Measures of type II error (p-values) for comparison statistics are presented with actual values if p=0.01 or larger (eg. P=NS and p<0.05 are not acceptable)	
Yes		A description of how patients were selected into each treatment group	By site
Yes		A statement is made as to whether the same surgeons operated on patients from different treatment groups	No different surgeons and different sites
		<b>OVERALL ASSESSMENT</b>	
		Are the results of this study valid	
		What is the magnitude and precision of treatment effect (if a control group was used and this can be determined)	
		Are the results applicable to your patient population	

Summary: A comparison of two procedures at two different centers. Each center specializes in their procedure. By having two different sites, though, there may be significant differences in practices, different patient populations. This study can show the difference results that the two procedures have and the differences in the post-operative course, but is also not valid as a head-to-head comparison.

Result summary:

Table 1: Patient parameters compared

Comparison of outcomes:

Pneumothorax	10% MIRPE	2% MRR
Pericarditis	0	2% MRR
Bar displaced	9%	0
Epidurals	96%	0
OR time	75 min (45-130)	212 min (110-260)
Hospital stay	6.5 d (5-8)	2.9 d (2-5)
Rehospitalization	2 pts	0 pts

Discussion: Strengths of the study - two high volume institutions, standard techniques. Weakness - retrospective. Long-term follow-up not included

- V. Moss RL, Albanese CT, Reynolds M. Major complications after minimally invasive repair of pectus excavatum: case reports. J Pediatric Surgery 36:155-158, 2001

Presented by Marion Henry, MD

Summary: This case report was included to generate conversation regarding how one balances the report and experience of major complications in the face of the published data such as we have in the preceding four papers when deciding whether to adopt new procedures into one's practice.

This paper presents case reports of five patients who suffered from 3 major complications, two of which were life threatening, after undergoing minimally invasive repair of pectus excavatum. The first patient suffered a cardiac perforation and underwent open repair of right atrial and ventricle holes as well as cardiopulmonary bypass for repair of a tricuspid valve injury. The second patient developed bilaterally empyemas and bacterial pericarditis requiring open pericardial debridement of his infection. The last three patients acquired thoracic outlet-like syndrome post-operatively with ongoing pain. In the first case, the operating surgeon had considerable experience performing the minimally invasive pectus repair and was NOT considered to be in the early stages of his learning curve.

Discussion: The discussion was limited due to time restraints, but it was briefly discussed. Issues of whether to quote outcome statistics such as those presented in the first two papers is valid or whether one's own outcomes, or some general standard of outcomes should be presented to parents considering these procedures.