



## Cardiac resynchronization in the elderly is beneficial, but could we implant our devices in old patients safer?

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We read with interest the article by Olechowski, *et al.*<sup>[1]</sup> recently published in the *Journal of Geriatric Cardiology*. The results of this retrospective analysis of patients undergoing cardiac resynchronization therapy (CRT) device implantation are in line with previous reports, suggesting that resynchronization therapy in the elderly is feasible and may lead to significant improvement of cardiac function and clinical status.

We think that the authors have provided very important data regarding safety of CRT device implantation in old patients. Thus, the total major complication rates were found equally distributed between the groups of patients > 80 and < 80 years old. However, pneumothorax was more frequently encountered in the older population. This complication is related to inadvertent lung injury by a needle during subclavian vein puncture, less frequently during axillary vein approach. Pneumothorax following pacemaker lead implantation is usually benign and managed by chest tube insertion with no further sequelae in otherwise healthy patients.<sup>[2]</sup> On the other hand, this complication might be devastating in very old patients with congestive heart failure, respiratory insufficiency, and other comorbidities.

Although there is a number of publications describing clinical outcome of CRT in the elderly, data on periprocedural complications is surprisingly lacking. We have performed an extensive PubMed search with the following key words: CRT, CRT-D, implantable cardioverter-defibrillator (ICD), resynchronization, old, and elderly. This search yielded 3256 papers dealing with CRT/ICD implantation in patients > 65 years old. On a second step, non-age-comparative studies, studies not analyzing safety of device implantation in patients > 75 years old, review papers, editorials and case reports were excluded. This resulted in a selection of 26 papers. Of those, the reports on ICDs only, studies

with insufficient data on complications were excluded. There was only one paper demonstrating prospective data combined from two randomized trials (MIRACLE and MIRACLE-ICD).<sup>[3]</sup> Regrettably, in a post-hoc analysis of safety in different age groups, the authors were unable to assess complications encountered during device implantation.<sup>[3]</sup>

Therefore, only five retrospective reports were available for procedure-related safety assessment, including the study by Olechowski, *et al.* (Table 1).<sup>[1,4-7]</sup> In four studies, the authors used 80 years as a cut-off value for delineation of the old population, and in one, 75 years. In each of these studies there was no statistically significant difference in total adverse event rates between older and younger groups. Of note, there was no difference in types of major complications between groups, except the report by Olechowski B. However, when pooled data from five reports were analyzed, there was a significant difference in the numbers of pneumothoraces between the older and younger patient groups.

Importantly, none of the reports included a detailed description of CRT device implantation technique. Therefore, we are unaware about the number and types of veins per patient used for primary CRT implantations and device upgrade procedures.

Several techniques have been proposed to lower the risk of pneumothorax during venous access for cardiac rhythm device implantation: ultrasound visualization of the subclavian vein,<sup>[8]</sup> axillary vein puncture instead of the subclavian vein,<sup>[9]</sup> cephalic vein as a sole access for all leads.<sup>[10]</sup>

It is anticipated that when the older patient is operated, the lesser the probability of reoperation in the future. Therefore, introducing of up to three leads over one small vein in an old patient should not be feared by operators. We suggest that in the older population only cephalic vein should be used for all leads, whenever possible. This simple change of approach might dramatically decrease the risk of

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**Table 1. Studies comparing the safety of CRT implantation in older and younger patients.**

Reference	Age cut-off, yrs	Number of younger patients	Number of older patients	Total early complications in younger patients	Total early complications in older patients	P	Pneumothorax in younger patients	Pneumothorax in older patients	P
Achilli A, <i>et al.</i> , 2007 <sup>[4]</sup>	80	1096	85	48 (4.4%)	2 (2.4%)	> 0.05	0	0	1
Verbrugge FH, <i>et al.</i> , 2013 <sup>[5]</sup>	80	171	49	66 (3.5%)	0	> 0.05	1 (0.6%)	0	> 0.05
Killu O, <i>et al.</i> , 2013 <sup>[6]</sup>	80	638	90	85 (13.3%)	13 (14.4%)	> 0.05	8 (1.3%)	2 (2.2%)	0.36
Höke U, <i>et al.</i> , 2014 <sup>[7]</sup>	75	590	208	31 (5.2%)	12 (5.8%)	> 0.05	3 (0.5%)	2 (1.4%)	0.158
Olechowski B, <i>et al.</i> , 2015 <sup>[1]</sup>	80	324	115	55 (17%)	18 (16%)	> 0.05	4 (1.2%)	5 (4.3%)	< 0.05
Total (all studies)	Both 75 and 80	2819	547	284 (10.11%)	45 (8.23%)	> 0.05	16 (0.57%)	9 (1.65%)	0.027
*Total (> 80 years old only)	80 only	2229	339	254 (11.40%)	33 (9.73%)	> 0.05	13 (0.58%)	7 (2.06%)	0.022

Percentages taken from different totals were compared as weighted averages. \*Only four studies included, where patients > 80 years are considered old.

pneumothorax during primary implantation, since no subclavian/axillary vein puncture is required. Moreover, this will allow preserving other routes for further possible interventions.

It is suggested that pneumothorax after CRT device implantation develops more frequently in older patients. Techniques, minimizing subclavian puncture, should be adopted by operators, and a sole cephalic vein access might be a reasonable approach in the elderly.

## References

- Olechowski B, Sands R, Zachariah D, *et al.* Is cardiac resynchronization therapy feasible, safe and beneficial in the very elderly? *J Geriatr Cardiol* 2015; 12: 497–501.
- Haug B, Kjelsberg K, Lappgård KT. Pacemaker implantation in small hospitals: complication rates comparable to larger centres. *Europace* 2011; 13: 1580–1586.
- Kron J, Aranda JM Jr., Miles WM, *et al.* Benefit of cardiac resynchronization in elderly patients: results from the Multicenter InSync Randomized Clinical Evaluation (MIRACLE) and Multicenter InSync ICD Randomized Clinical Evaluation (MIRACLE-ICD) trials. *J Interv Card Electrophysiol* 2009; 25: 91–96.
- Achilli A, Turreni F, Gasparini M *et al.* Efficacy of cardiac resynchronization therapy in very old patients: the InSync/InSync ICD Italian Registry. *Europace* 2007; 9: 732–738.
- Verbrugge FH, Dupont M, De Vusser P, *et al.* Response to cardiac resynchronization therapy in elderly patients ( $\geq 70$  years) and octogenarians. *Eur J Heart Fail* 2013; 15: 203–210.
- Killu AM, Wu JH, Friedman PA, *et al.* Outcomes of cardiac resynchronization therapy in the elderly. *Pacing Clin Electrophysiol* 2013; 36: 664–672.
- Höke U, Putter H, Van Der Velde ET, *et al.* Left ventricular reverse remodeling, device-related adverse events, and long-term outcome after cardiac resynchronization therapy in the elderly. *Circ Cardiovasc Qual Outcomes* 2014; 7: 437–444.
- Seto AH, Jolly A, Salcedo J. Ultrasound-guided venous access for pacemakers and defibrillators. *J Cardiovasc Electrophysiol* 2013; 24: 370–374.
- Migliore F, Siciliano M, De Lazzari M, *et al.* Axillary vein puncture using fluoroscopic landmarks: a safe and effective approach for implantable cardioverter defibrillator leads. *J Interv Card Electrophysiol* 2015; 43: 263–267.
- Ussen B, Dhillon PS, Anderson L, *et al.* Safety and feasibility of cephalic venous access for cardiac resynchronization device implantation. *Pacing Clin Electrophysiol* 2011; 34: 365–369.

## Authors' reply

We thank Mikhaylov and Lebedev for their detailed comments. They suggest that cephalic approach should be used for all 3 leads at implant, thereby minimizing the risk of pneumothorax during CRT device implantation in the elderly. We found that pneumothorax complicated procedures more frequently in those aged > 80 years old. It should be noted that in our series, 22% of procedures were upgrades, which is associated with higher risk of complications. In such procedures it is common for the cephalic vein

to have been tied and used for previous lead access (cannot be used again).

We do not have data as to the venous access approach for the procedures, but agree that careful planning for complex cases is crucial. Where possible the cephalic vein should be used, but in our experience it does not always permit access for 3 leads. A venogram visualizing the local venous anatomy accurately can be helpful and we would argue almost essential for patients undergoing upgrades.