

Fixed or handheld mouth piece assembly influences the measurement of slow vital capacity and its subdivisions

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Introduction

Measurements of static lung volumes include a slow vital capacity (SVC) manoeuvre. Some equipment allow free movement of the torso and mouth piece assembly (MPA) during the manoeuvre while others do not, with the MPA being in a mounted fixed position.

Materials and Methods

We measured SVC and its subdivisions, inspiratory capacity (IC) and expiratory reserve volume (ERV), on a SensorMedic Spectra 229 apparatus in 14 subjects (8 men). Measurements were done with the MPA handheld and with the MPA in fixed position in random order. Furthermore, measurements were done on a SensorMedic Vmax22 with the MPA mounted in a V6200 Autobox, and on a Morgan Benchmark apparatus with handheld MPA in another group of 16 subjects (4 men).

Results

On the SensorMedic Spectra 229, the SVC was $4,98 \pm 1,16$ L, ERV $1,48 \pm 0,48$ L and IC $3,47 \pm 1,04$ L with the MPA handheld, and $4,90 \pm 1,11$ L, $1,59 \pm 0,50$ L and $3,23 \pm 0,88$ L with the MPA fixed ($p=0,021$ for SVC, $p=0,025$ for ERV and $p=0,002$ for IC). Measured SVC was higher on the Morgan Benchmark apparatus compared with the SensorMedic Vmax22, $4,79 \pm 0,96$ and $4,43 \pm 0,89$ L ($p=0,004$). The difference between the two apparatuses was mainly attributable to a difference in ERV, $1,96 \pm 0,42$ and $1,57 \pm 0,42$ L ($p<0,001$).

Table 1

Static lung volumes. All results reported in accordance with the ERS standard.

	N	Minimum	Maximum	Mean	Std. Deviation
VC, handheld MPA	14	3,57	7,10	4,98	1,16
VC, fixed MPA	14	3,59	6,96	4,90	1,11
ERV, handheld MPA	12	0,79	2,63	1,48	0,48
ERV, fixed MPA	12	0,97	2,68	1,59	0,50
IC, handheld MPA	12	2,33	5,84	3,47	1,04
IC, fixed MPA	12	2,19	5,16	3,23	0,88

Table 2

Differences in lung volumes, relative to measurements with handheld MPA.

	N	Mean	Std. Deviation
Difference in VC (%)	14	-1,56*	2,65
Difference in ERV (%)	12	8,45*	11,23
Difference in IC (%)	12	-6,28*	4,38

* : Significant difference $p<0,05$.

Discussion

With two of our subjects, we were not able to obtain reproducible data for ERV and IC according to the ERS standard. We chose to exclude the ERV and IC results for these two subjects, but include their SVC-results in our analysis. Had we included them, with mean ERV and best IC reported, the overall differences in ERV and IC would not have been statistically significant.

Conclusion

The MPA setup influences the measurement of SVC and its subdivisions significantly, and contributes to differences between different lung function testing equipment.

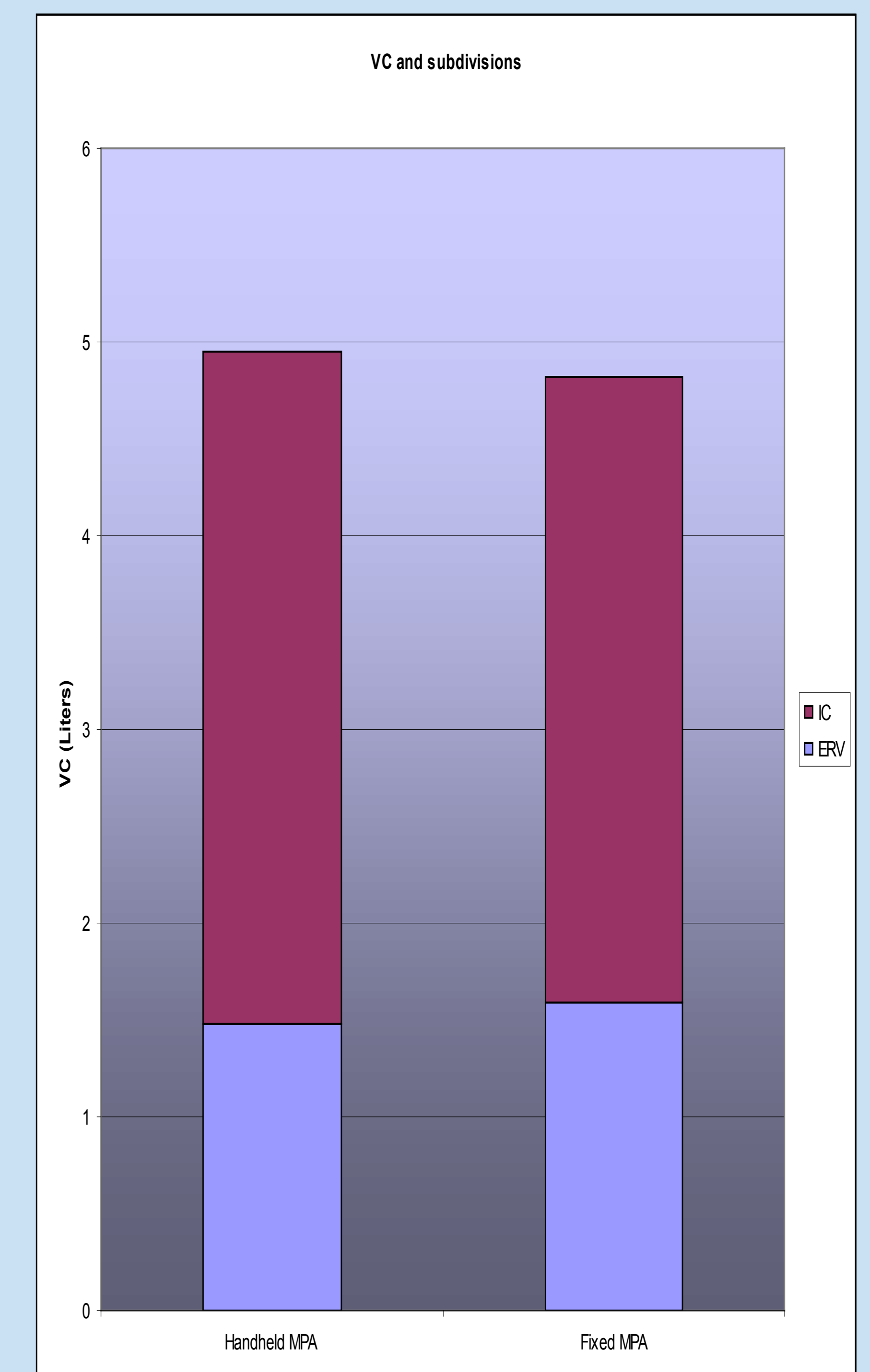


Figure 1
Illustration of the differences in vital capacity (VC), and its subdivisions, expiratory reserve volume (ERV) and inspiratory capacity (IC).

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