

NON-INVASIVE TREATMENT OF ABDOMINAL HYPERTENSION: A NEW VACUUM CHAMBER



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BACKGROUND

Abdominal Hypertension (AHT) is a complex condition which can be anticipated by lowering intraabdominal pressure (IAP) by surgical procedures. We have developed ABDOPRE [1] to achieve the same goal non invasively. ABDOPRE applies a controlled negative pressure onto the abdomen [2] by means of a special kin gasket and a bladder catheter [3], [4]. ABDOPRE is not applied continuously but follows alternating pressure protocols.

SPECIFICATIONS

The bell must be resistant to negative pressures necessary to lower IAP. It should be light enough to be easily handled in clinical settings and resistant to disinfection with alcohol or hydrogen peroxide (PPH) [5]. It should be transparent so as to see the skin of the patient during treatment. Skin contact should be harmless. Inside pressure must be accessible for measurement and control.

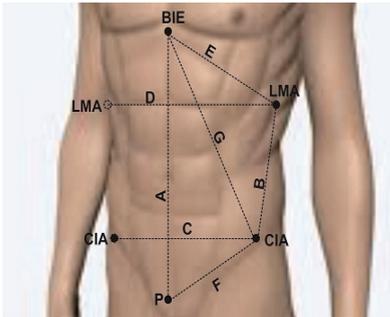


Fig. 1 Bone footholds for ABDOPRE Bell.



Fig. 2 Measuring "A" with *compas d'épaisseur*

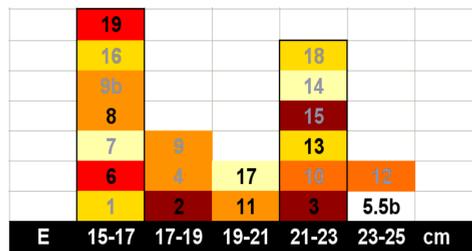


Fig. 3 Histogram of measure "E" showing two peaks.

patient	A	S1:27	S2:33	B	S1:19	S2:24	size
1	27,9	-0,9	5,1	18,4	0,6	5,6	1
2	34,8	-7,8	-1,8	25,9	-6,9	-1,9	2
3	35,7	-8,7	-2,7	25,3	-6,3	-1,3	2
4	28,0	-1,0	5,0	18,1	0,9	5,9	1
5	32,4	-5,4	0,6	23,1	-4,1	0,9	2

Table 1 Measures "A" and "B" of 5 patients with size S1 & S2 bell fits. Yellow = best fit.

DESIGN OF THE BELL

To avoid the bell to cave into the abdomen, it must be applied onto solid bone footholds: iliac crests, sternum, pelvic bone and ribs. Two 19 patients series were measured in the intensive care unit (ICU), the first to define the bell size and the second to evaluate fitting. Measurements were taken with *compas d'épaisseur*. Every measure was displayed as a histogram, which led to define two sizes. A second group of patients was measured and fitted to either size 1 or size 2 of the bell, by minimum squared differences.

It was found that patient height and thoracic width are dominant. Hip width is non critical because of the ample base around the iliac crest, which discards gender specific bells for ICU patients.

The Bell is made of 4mm 93% transparency PMMA, 1,18g/cm³, impact, alcohol and iodine resistant with silicon gasket for skin contact: all prone to PPH sterilization. Pump and pressure sensor connectors & a handle are added.



Fig. 4 Original Bell with pressure sensor and vacuum connectors 5.6L.



Fig. 5 Redesigned Bell with larger capacity 8.2 L.



Fig. 6 Present Bell design in two sizes 13.7L & 20.3L.

CONCLUSIONS

Measurements taken on ICU patients allowed to design two sizes of ABDOPRE bells using transparent material with a gasket.

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