Standardization of a pressure-measuring device for optimizing lymphedema treatment with compression garments

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Background

- Breast cancer is the most common cancer in women
- Treatment of breast cancer often results in axillary clearance and radiotherapy with lymphedema as a complication
- Lymphedema is initially treated with compression stockings
- Compression is empirically well-proven
- Few studies measure the actual pressure under the garment

Background

- The measurement method could provide more customized treatment
- Better prerequisite for future research

Aim

- Create measurement method using I-scan® (Tekscan Inc.) pressure measurement equipment
- Measure the initial pressure as 5 compression garments from 3 manufacturers
- Measure the pressure that the garment exerts after simulated wear and tear

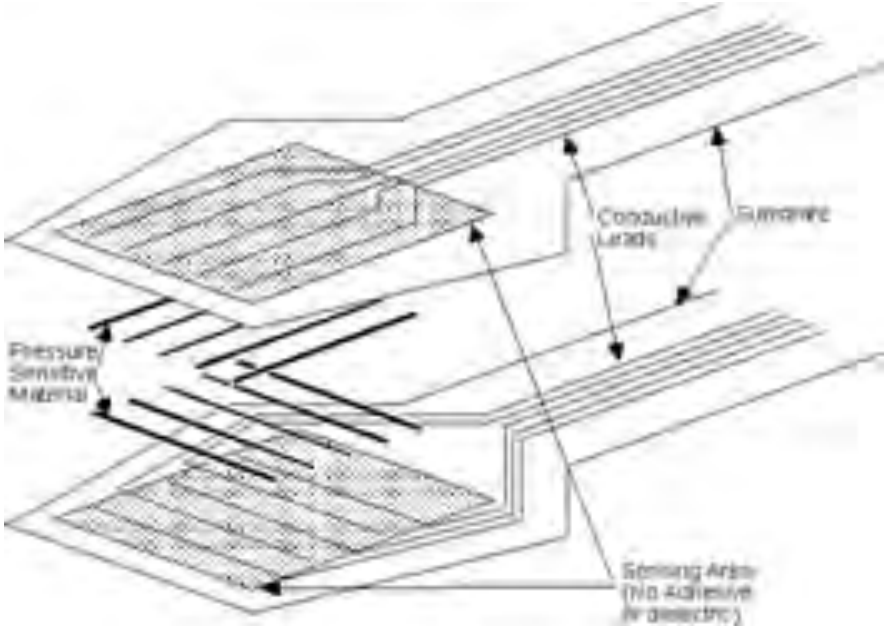
Method and Material

Compression Garments

- 5 compression garments from 3 companies A, B, C
- Compression class 3: 34.0 - 46.0 mmHg

Pressure Measurement Device

- I-scan® (Tekscan Inc.)
- Ultra-thin sensor



Pressure Measurement Device

- Transducer
- PC

Pressure Measurement Device

- Calibration of the sensor

Plastic Legs

- 15 legs, HD polyetylene
- Tonometry test of 3 different surface materials: (1) bare legs, (2) legs lined with standard Velcro (Polyamide), (3) legs lined with Poron urethane foam
- Poron urethane foam is close to human tissue

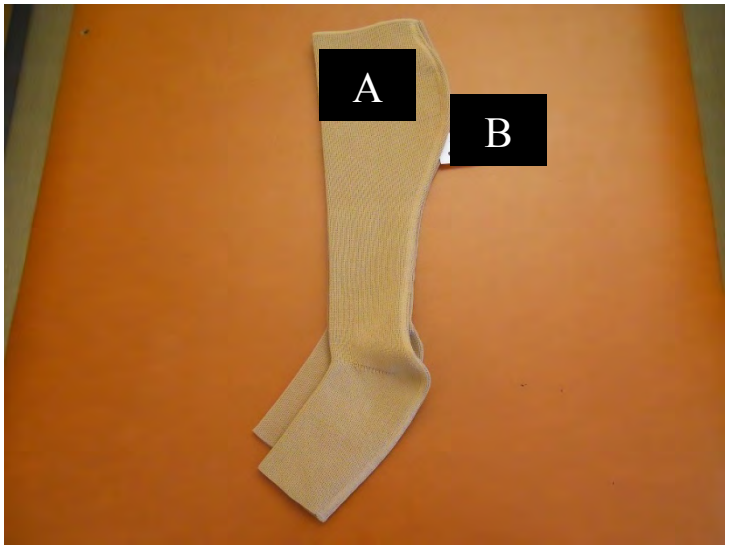
Measurements

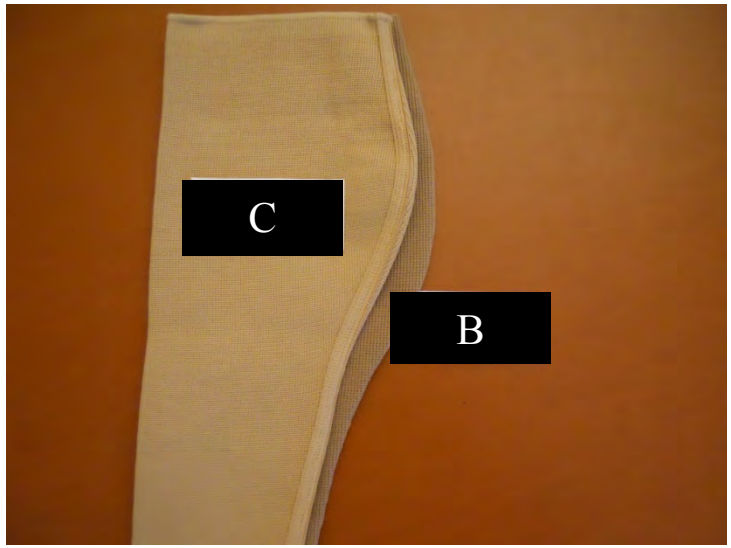
Simulated wear and tear

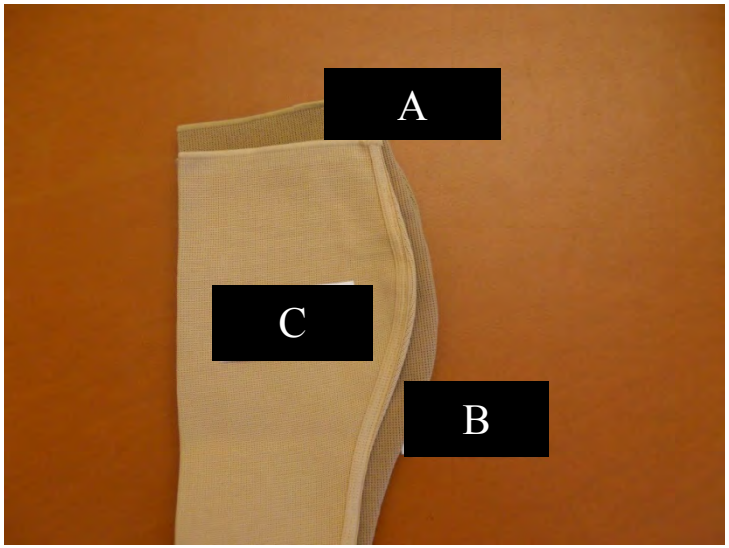
- Initial measurements
- Thereafter weekly program: garments washed every evening to dry during night, put on plastic legs daytime during 7 days
- After 7 days subgarment pressure is registered
- This is repeated during 4 weeks

Results

Visual difference in the profile of garments



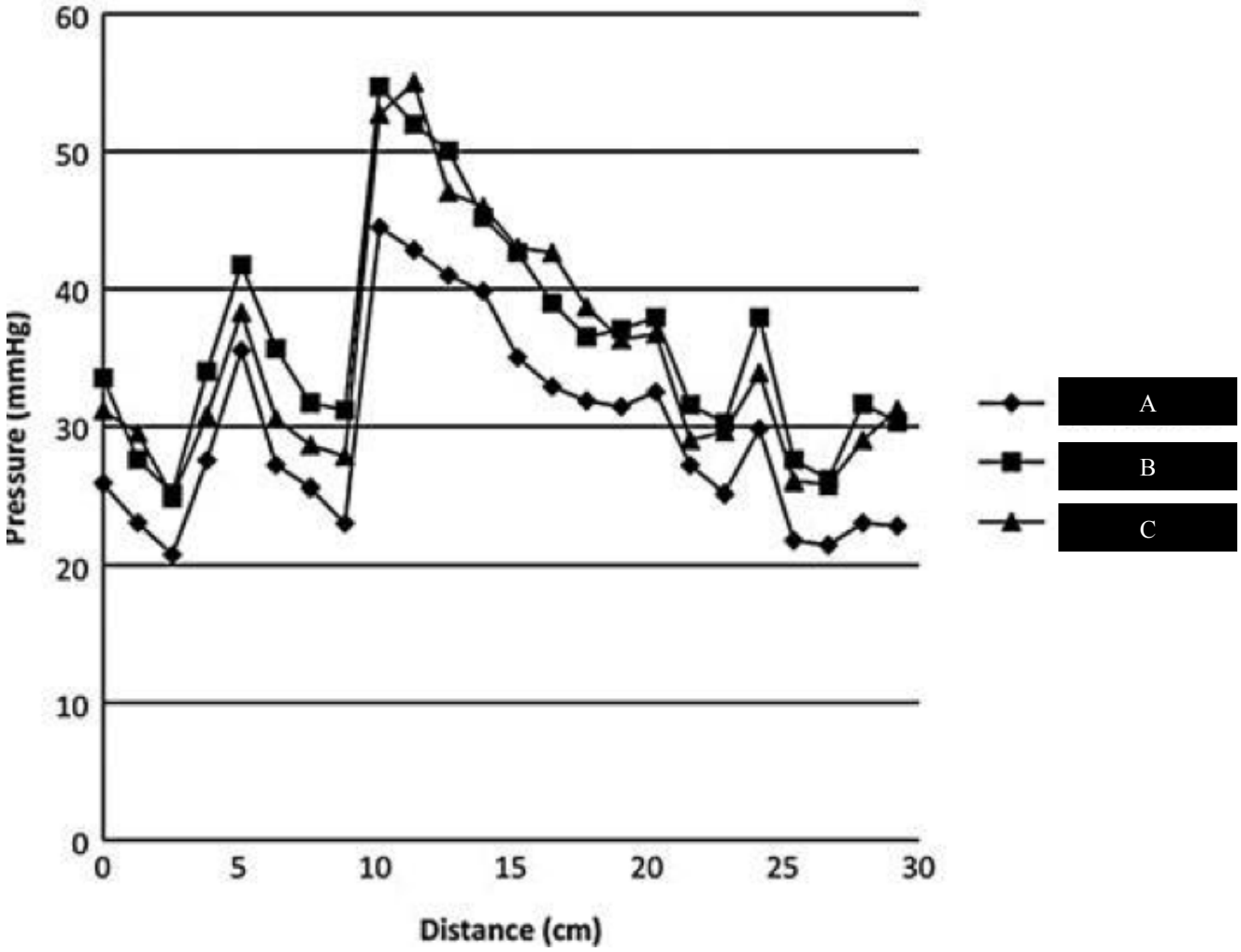




Initial Measurements

mmHg	A	B	C
Mean	29,7	36,3	35,2
Median	27,4	34,8	31,2
Max	44,5	54,7	55
Min	20,8	25,1	24,9
SD	7,1	8,1	8,6
SEM	1,5	1,6	1,7
Number	24	24	24

Initial Measurements

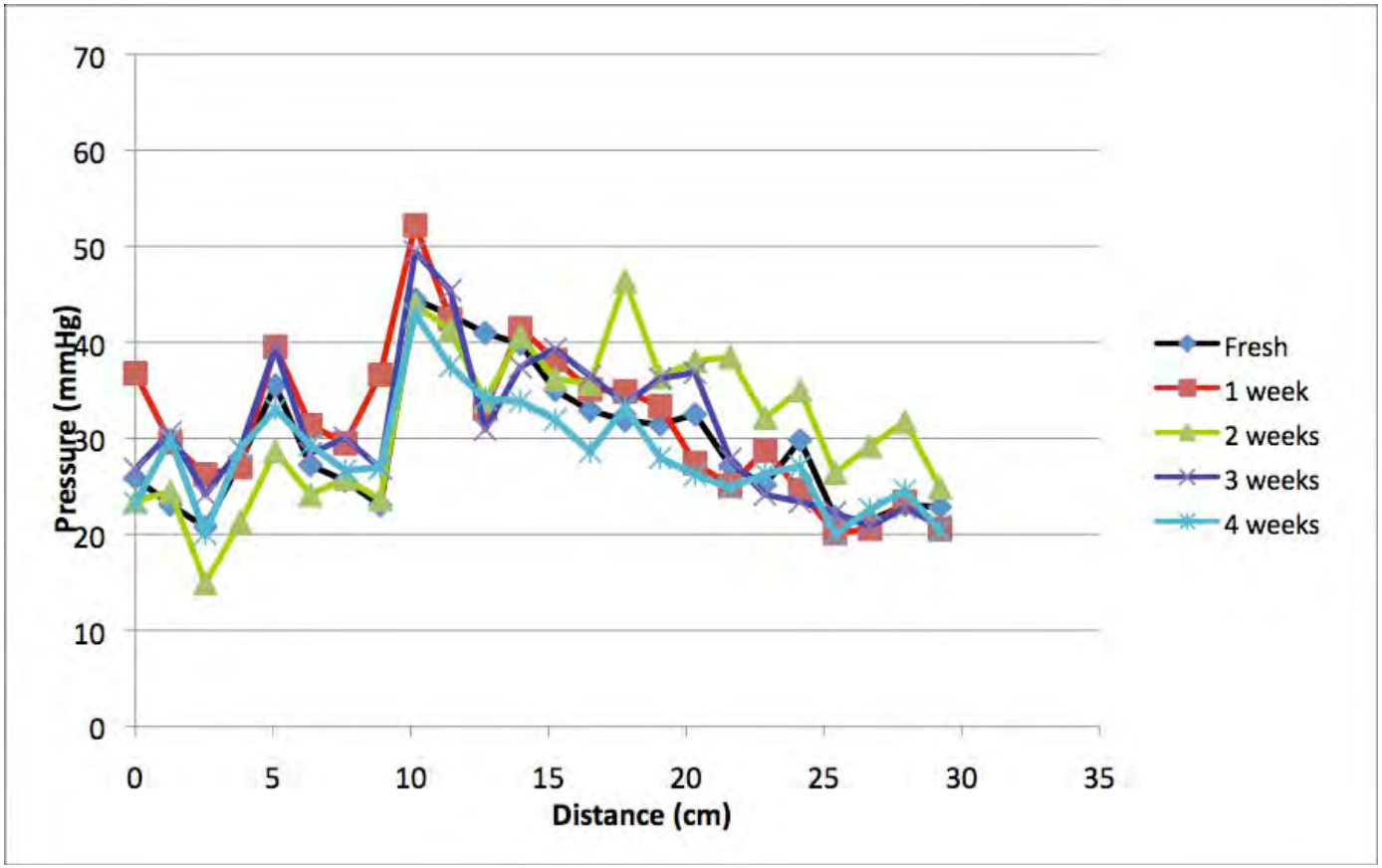


Initial Measurements

	A vs B	**A vs C**	**B vs C**
Fresh	$p < 0.0001$	$p < 0.0001$	$p < 0.05$

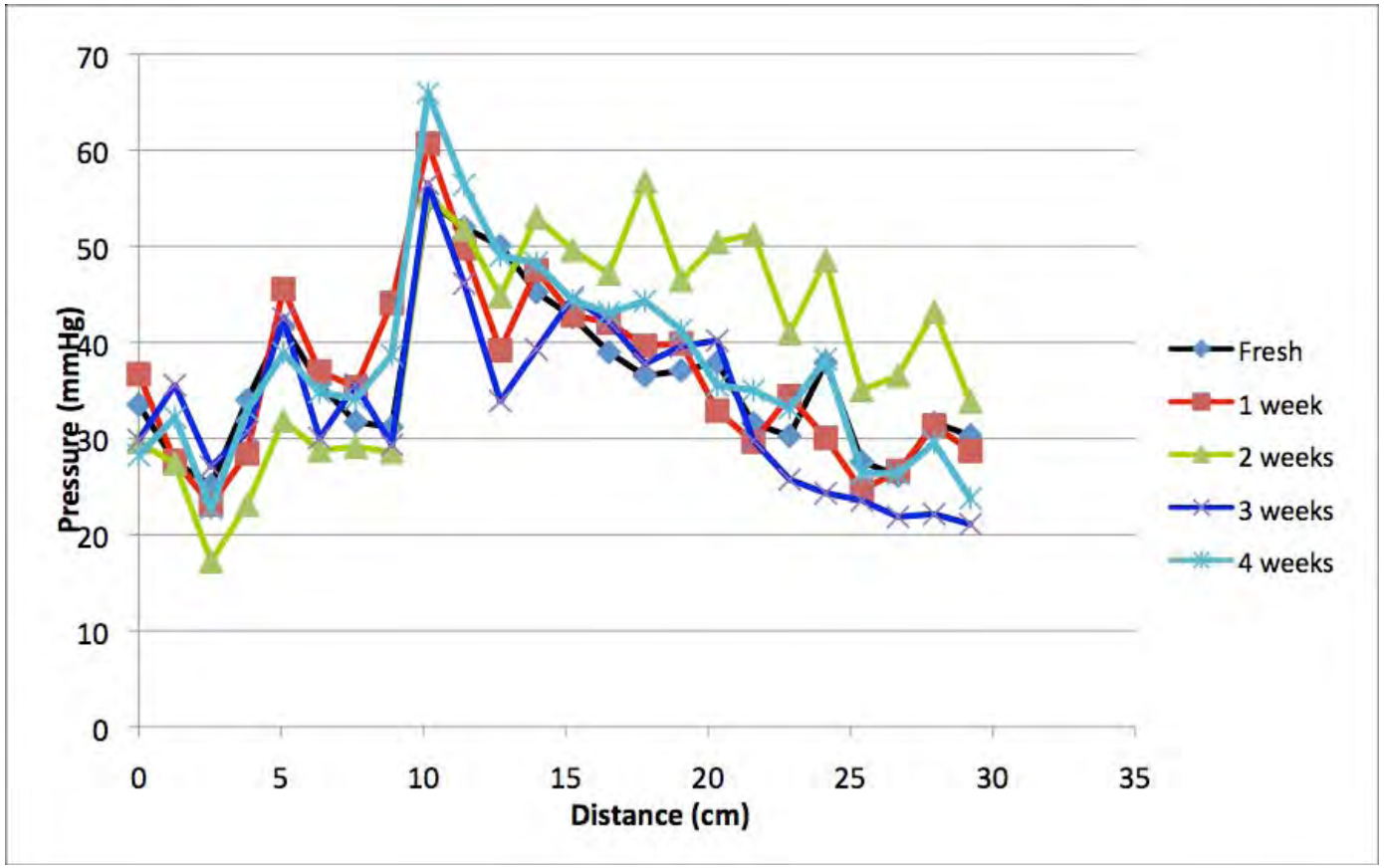
Measurements after Wear and Tear

Garment A



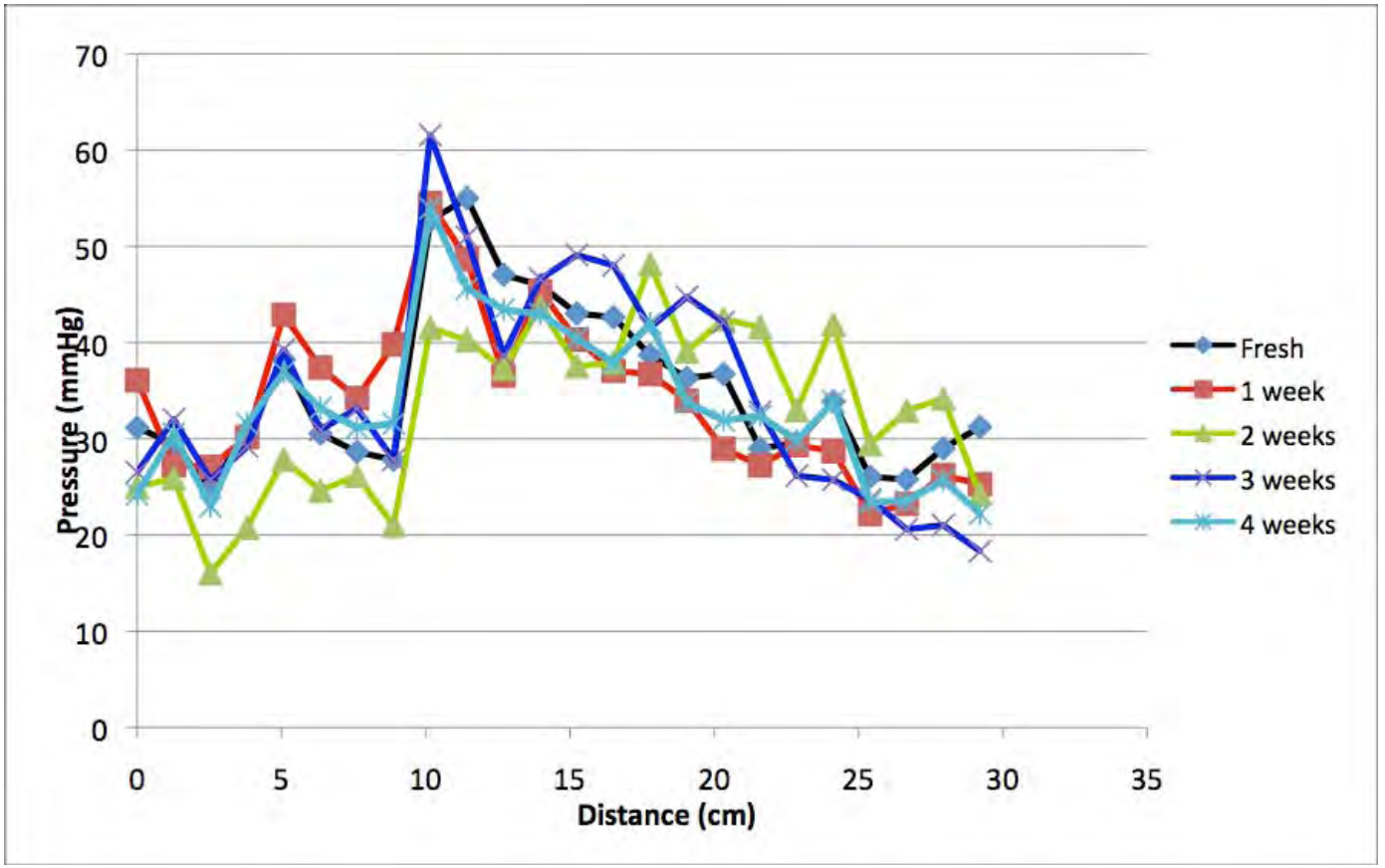
Measurements after Wear and Tear

Garment B



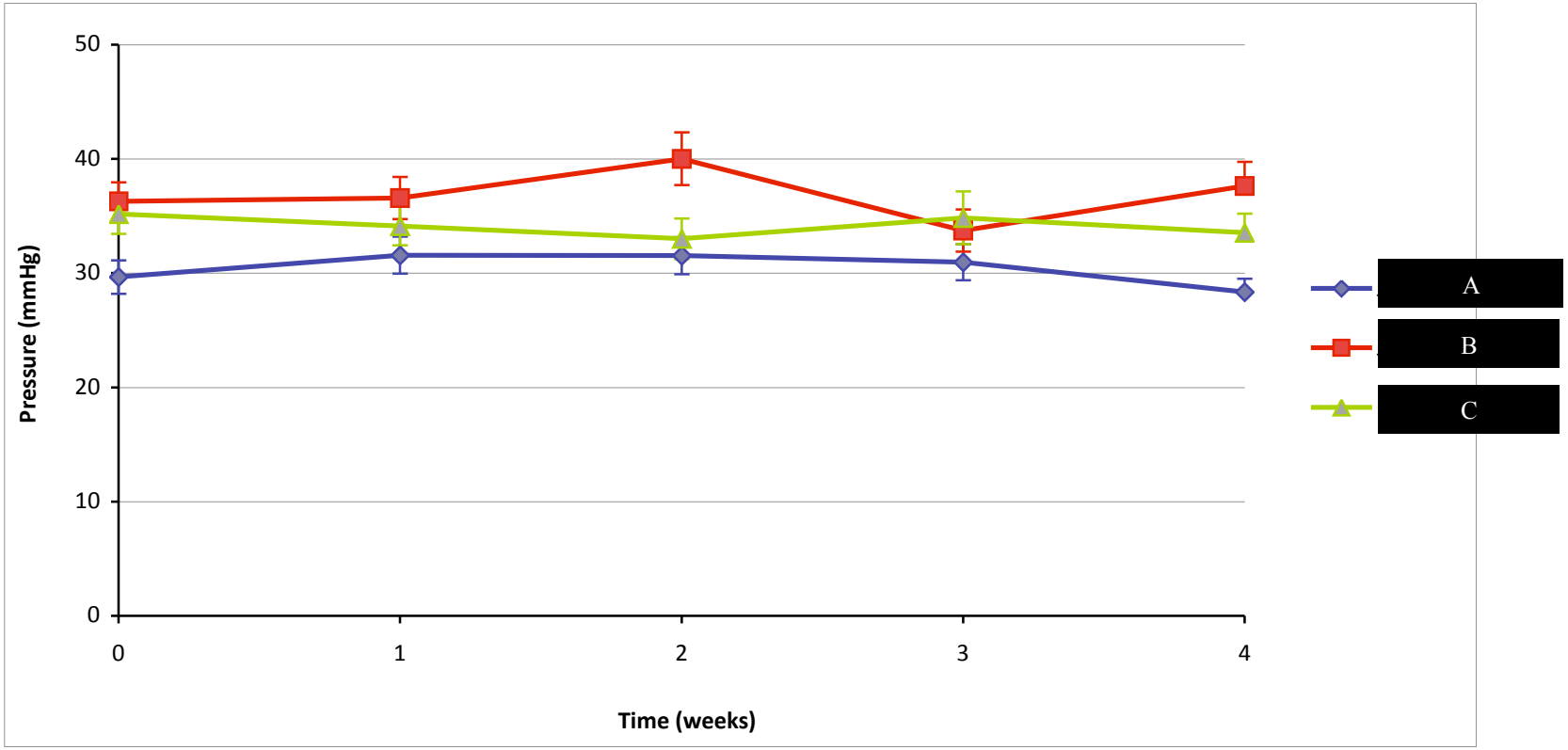
Measurements after Wear and Tear

Garment C



Measurements after Wear and Tear

Median (1q and 3q)



Measurements after Wear and Tear

	Fresh vs 1 week	**Fresh vs 2 weeks**	**Fresh vs 3 weeks**	**Fresh vs 4 weeks**
A	NS	NS	NS	NS
B	NS	NS	$p < 0.05$	NS
C	NS	NS	NS	$p < 0.05$

	A vs B	**A vs C**	**B vs C**
Fresh	$p < 0.0001$	$p < 0.0001$	$p < 0.05$
1 week	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
2 weeks	$p < 0.0001$	$p < 0.05$	$p < 0.0001$
3 weeks	$p < 0.0001$	$p < 0.001$	NS
4 weeks	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$

Conclusion

- Tekscan can be used to measure subgarment pressure
- The device can be used to measure the pressure profile of garments along the extremities and compare various manufacturers after simulated wear and tear
- Measuring subgarment pressure is important for future research and in improving lymphedema treatment

Conclusion

- There are differences between manufacturers in terms of pressure profile
- In order to achieve a reduced pressure due to simulated wear and tear, longer observation time is required
- To facilitate clinical use, a new type of sensor needs to be developed

Thank you for your attention