Intracranial pressure (ICP) is an important neurological parameter in animals and humans. ICP is a function of the relationship among three contents into the cranium (brain parenchyma, cerebrospinal fluid and blood) and the skull volume. Nowadays, all methods to monitor the ICP are invasive, and physicians need to make a hole in the skull and insert the sensor in the intracranial space, which can cause to the patient several problems like hemorrhage, swelling and infection.

The ICP STUDY GROUP developed - with Pan America Health Organization (PAHO), São Paulo Research Foundation (FAPESP), Brazilian Ministry of Health and Brazilian Ministry of Science Technology and Innovation support - new methods to monitor intracranial pressure through detection of the skull bone deformation. Two different sensors are in tests with humans and animals and the results of comparison between new methods and the invasive sensor showed a good statistic correlation (Pearson Correlation of 0.95), encouraging our group to continue with the development.

The technology of these sensors was developed with the objective of decreasing the risks to the patient and make the sensor less expensive. The cost of actual (invasive) sensor is a problem to countries in Latin America and Africa, for instance, and in Brazil the ICP monitoring is done only in medical schools and private hospitals. Thus, access to these important neurological parameters is strict, and the population ends up suffering from lack of medical assistance.

The expected final result of this project is the use of this new equipment in the Brazilian health system, a program that achieves 100,000,000 people.

RESULTS AND DISCUSSION

Figure 1. Equipment and Non-invasive sensor.

Tests in animals (rats) were made after approval by ethics committee trial. Baseline was monitored and then manual and/or automatic saline infusion was started until the invasive sensor presented significant changes in intracranial pressure (20 to 40 mmHg). Time series were obtained with acquisition rate of 200Hz. Data smoothing was implemented with a 10 seconds moving average window. All data analysis were performed using the ICM+ software (Cambridge Enterprises).

Figure 2. Infusion test. Saline (0,9%) was injected into the spinal channel to induce intracranial hypertension.

CONCLUSION

From the results above, we conclude that this non-invasive method is capable of monitoring with good agreement the morphology and dynamics of ICP, opening new avenues in brain research and also to its insertion in the Brazilian Public Health System (SUS) in the future.

ACKNOWLEDGEMENTS

REFERENCES

BRAZILIAN INDUSTRIAL COMPLEX AND INNOVATION IN HEALTH:
http://portal.saude.gov.br/portal/saude/Gestor/area.cfm?id_area=1504