# Short Report on Hospital Visit to Interbalkan Medical Center

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Date of Visit: 13/12/2023
Date of Report: 30/12/2023

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## I. Introduction

At 13/12/2023 we visited the Interbalkan Medical Center, where we briefly saw the emergency room and its organisation but mostly we saw the function of biomedical equipment like BrainLab, the OEC C-arm, the craniotomer and an orthopedic drill, as explained below.

## II. Biomedical Equipment Shown

### A. BrainLab

BrainLab is a type of navigation system for cranial and spinal cord surgeries with 2D MRI and CT scan data handled by the program, and calibrated to the 3D space in order for the surgeon to be able to see where the problem area is and how big the craniotomy is needed to be. Here, the camera transmitter [1] was demonstrated who along with the appropriate reflective tool, triangulates stable points of the patient and uses them to registrate the 2d imaging data into the three dimensions. The operator of the machine chooses which MRI or CT scan images will be used and registered, which areas of the brain should be visible in the field of view along with the facial characteristics of the patient which are crucial for calibrating the digital image of the MRI to the actual patient in the 3D space. There are two ways to do the beforementioned calibration which are, the setting of stable points on the face of the patient through the software and pointing at then with the reflective pen or scanning the area with the Z-touch laser tool [2].

### B. Stryker Opthopedic Drill and Craniotomer

The craniotomer's function is either removing part of the skull for a craniotomy and exposing the brain or trepanation for the treatment of hematomas by putting a tube in that area. Here the instructor went in detail how the skull is opened, with a series of three holes in a cross-like pattern being drilled, and then another tool is used which cuts the skull between the three holes while preventing the brain to be injured by its specific design. After we had understood that procedure, the instructor presented the Stryker Rotary Orthopedic drill [3] which is powered by a battery, which is loaded into the drill with a specific procedure since the battery is unsterile while the drill itself is sterile. The instructor showed to us the care and specific movements it takes to load the battery, and talked to us about the different drilling bits and how they locked into the drill by the chuck and what their purpose was.

### C. Diathermy Machines

After the Brainlab demonstration, a second instructor presented the diathermy machines, monopolar and bipolar, and explaining to us the difference between them, with monopolar machines needing grounding pads, and also the patient not to wear any metal accessories due to danger for burns. Moreover, the necessary grounding wires were shown for monopolar and bipolar machines, and even if we had seen the monopolar grounding wire that day in Papageorgiou General Hospital we hadn't seen the bipolar one. The instructor took the time to mention, that bipolar machines are a more recent technology advancement and used mainly for microsurgeries, and delicate procedures like neural surgeries, and that they don't have any problem with patients being in contact with metal components or having pacemakers. Also, Dr. Alkinoos Athanasiou explained to us the difference between coagulation and cutting when it comes to the output current, and the fact that for cutting tissue, 95 to 100 percent of the duty cycle there is a continuous current output in order to burst the tissue and cut it, while in coagulation mode, 5 to 10 percent of the duty cycle presents a current output in order for the tissue to get cold when current is not applied and reach coagulation. The frequencies tend to be higher in cutting as well, around 5kHz while in coagulation mode, they tend to be around 100Hz with current having the same amplitude in both modes.

### D. OEC One GE Healthcare

The third instructor was a Radiologist with the OEC One C-arm machine from GE Healthcare [4], which creates real time imaging data, for surgeons to monitor in real time the changes they perform. The general purpose of this machinery is the production of examinations providing information about the patient and ensuring as less invasive procedures as possible. Since the machine irradiates the patient for imaging data, a plus is its ability to produce data at the time of surgery with no delay, at any area of interest and at any moment without a problem. The instructor emphasized also the importance of having the machine correctly calibrated to each surgery and its needs, since small variations in calibration can cause a variety of consquences like ill-put implants in fractures or more invasive procedures for patients. However, one of the downsides of the machine is that the patient is irradiated for the duration of time it takes the operator to get the needed image, and the radiologist personnel tries to keep the irradiation to a minimum, to protect the patient as best as possible but also prevent the irradiation of the rest of the healthcare staff present. The protective measures in place against radiation, is the use of lead lined vests by radiologists and doctors keeping physical distance when possible from the C-arm machine when

imaging happens. The instructor also explained to us the pros and cons for the patient's health when they have to consume tracer substances like allergic shocks, or dermal reactions etc. The instructor also told us that the operators of the machine can control the amount of energy outputted, regarding the area of which it is being X-rayed, for example a hand takes less energy than a thoracic area to X-ray since the thoracic area has more information that needs to be seen.

## III. Discussion

We saw all this equipment that's it difficult to summarise the report in one page, but personally I believe our instructors were really helpful and patient with us and all the biomedical equipment we saw, made us realise how the right tool can help make the work of healthcare personnel easier. A great experience overall, and we are all super thankful we actually participated and gained hands-on experience with equipment.

## References

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