FLUOPTICS©

Protocol developed and used by Dr. Fares Benmiloud (Hôpital Européen de Marseille): Combined use of autofluorescence and ICG angiography during thyroid surgery

1. After skin incision, dissociation of infrahyoid muscles, section of middle thyroid vein and branches of the superior pole of the thyroid, the thyroid lobe is medialized and examined by autofluorescence. Most of the time, at this early stage of the surgery, the parathyroid glands can already be detected by autofluorescence, while they are not detectable with the naked eye of the expert. Once the parathyroid glands are identified visually, we look for the recurrent laryngeal nerve. As soon as all these elements are identified and localized the actual lobectomy can start.

2. Once the first lobectomy has been performed, surgery starts on the other side of the thyroid with the same process. Section of the middle thyroid vein and of the superior pole branches, medialization of the thyroid lobe, autofluorescence examination to look for parathyroid glands, visual verification of the parathyroid glands and the recurrent nerve. At this stage, the parathyroid gland feeding blood vessels and vein pedicle are hardly identifiable with certainty.

3. The third step is a cartography of the blood vessels which feed the parathyroid glands, in order to be able to preserve them during the next steps of the dissection.

Once the parathyroid glands in the second lobe have been identified, an injection of 0.1mg/kg of Indocyanine green is performed. It allows to visualize by fluorescence the vessels of the thyroid and the parathyroid glands and:

- Either this imaging allows to clearly identify the feeding pedicle which enters in the parathyroid gland and therefore identifies the blood vessels to be saved.
- Or this imaging allows to visualize an area of interest where the parathyroid vascularization comes from and where it is evacuated from. This anyway provides information on the area to be preserved in order to be safe.
- Rarely, there is no information, either because the injection is performed too early in the dissection process, which happens sometimes at the beginning of the learning curve, or if there is a technical problem, or, rarely, if the parathyroid gland has no identifiable pedicle.

For each injection, a movie is recorded, and it can be replayed at a slow pace to visualize the critical timing because the signal might change very quickly sometimes.

4. The fourth step is to check the perfusion of the remaining parathyroid glands on the first side of the thyroid before actually starting the lobectomy on the second side.

Autofluorescence allows an early detection of parathyroid glands during thyroidectomy. This detection is often performed before the naked eye and allows to focus the attention of the surgeon. This has a direct impact on the quality of the dissection.

The specificity of this protocol is to add an intraoperative angiography which allows to understand the vascularization of the parathyroid glands in order to finalize the surgery.

This approach provides early images of the parathyroid glands and their pedicles. This gives to the surgeon the ability to better preserve these critical glands.

This approach also informs on the vascular status of the parathyroid glands at the end of the surgery.

Compared to the conventional technique (without imaging) the gain is significant.