

Chrysanthi Anamaterou  
Dr. med.

## **Functional evaluation of parathyroid grafts after total parathyroidectomy and autotransplantation into the tibialis anterior muscle for the treatment of secondary and tertiary hyperparathyroidism**

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Doktorvater: Priv.-Doz. Dr. med. Hubertus Schmitz-Winnenthal

Secondary and tertiary hyperparathyroidism are frequent complications of chronic renal insufficiency, especially end-stage renal disease. The management of secondary hyperparathyroidism is predominantly pharmacological, whilst treatment of tertiary hyperparathyroidism is surgical.

For secondary hyperparathyroidism three different surgical procedures have been described: subtotal parathyroidectomy and total parathyroidectomy with or without autotransplantation. Surgical management of tertiary hyperparathyroidism can be performed using either subtotal parathyroidectomy or total parathyroidectomy with autotransplantation. The sternocleidomastoid muscle, the subcutaneous abdominal adipose tissue or the forearm muscle are the preferred site of the parathyroid autograft. Currently, there is no accepted standard for either the optimal site of AT or for defining a fully functional autograft.

The preferred surgical therapy for renal hyperparathyroidism at the University Hospital of Heidelberg is total parathyroidectomy with heterotopic autotransplantation into the tibialis anterior muscle. This study describes this new autotransplantation site. The aim of this project was to assess the long-term function of the auto-transplanted parathyroid tissue in this type of surgical procedure.

The function of the autograft of 42 patients was assessed 8.2 ± 2.5 years after surgery, using a modified Casanova-test of the leg bearing the parathyroid tissue. Ischemic blockage was induced by tourniquet and the levels of parathyroid hormone (PTH) were assessed during the test.

At the point of assessment, two patients had developed graft-dependent recurrent hyperparathyroidism (5 %) without therapeutic consequences and three patients suffered from persistent symptomatic hypoparathyroidism (7 %). These findings are consistent with the results in other surgical approaches.

The ischemic blockage led to a significant reduction in the concentration of PTH ( $\geq 50$  % of the baseline value) in nineteen patients (45 %) indicating well-functioning autografts. In eleven patients (26 %), ischemic blockage did not cause any change in the concentration of PTH ( $\leq 20$  % of the baseline value) indicating functioning

residual parathyroid tissue from another site. The source of PTH was classified as unidentifiable in five patients (12 %). Several studies have observed sufficient PTH- and calcium levels after parathyroidectomy with autotransplantation, but the source of PTH secretion has not been defined.

Four patients with undetectable PTH levels had diabetes mellitus, indicating that diabetes and its associated complications may be a significant factor for the graft function ( $p < 0.05$ ). Further significant factors for the autograft survival and function or predictors for the Casanova-test were not found.

These results indicate that total parathyroidectomy with autotransplantation into the tibialis anterior muscle is a safe and successful alternative surgical treatment for renal hyperparathyroidism (88%) and that the modified Casanova-test is a suitable diagnostic tool for autografts function.