

ELECTROPHYSIOLOGICAL MEASUREMENTS OF TUMOR AND NORMAL TISSUE

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Measurements of electrophysiological properties of cells such as the transmembrane resting potential, can indicate physiological changes and differences between cell types. Cancerous and normal cells of the same cell type are characterized by different transmembrane resting potential (TMRP) values.

On the basis of this knowledge measurements of tumor and normal tissue of the same patient were carried out and compared to normal tissue of patients with non-malignant diseases. The aim was to confirm the difference of tumor values to normal values in order to assist in patient diagnosis via biopsies and to investigate the TMRP of normal tissue of tumor patients and non-tumor patients.

As described in the article "Diagnose und Therapie von Krebszellen", same publication, about 1000 single measurements have been carried out so far. Method and experimental protocol is listed in the above mentioned article. Together with latest data, we have carried out about 1600 single measurements from 11 tumor- and corresponding normal-tissue-samples and 30 samples of patients with non-malignant diseases. The measuring method could be improved by continuing to impale the glass-microelectrode into the tissue until the potential reaches a stable plateau (Fig. 1) in contrary to former measurements of the surface cell layer. The conclusion that this reproducible procedure results in the most probable potential, can be supported by two hypothesis:

1. The outer cell layer is increasingly damaged with time after operation with decreasing TMRP's. The deeper the electrode is impaled into the tissue, the better the chance to measure unaffected cells. When the point is reached where the TMRP does not increase further by deeper impalement, the maximal TMRP value is registered.
2. By impalement into tissue, the electrode resistance grows due to continuous obstruction of the electrode tip, which is reversible, when the electrode is withdrawn. In the case of maximal resistance, the measured potential on the cell membrane represents the maximum. In both cases, maximum impalement into tissue is required.

The results confirm partly the tendency of the previous results: statistically significant decreased TMRP values for the normal tissue as compared to the tumor tissue of the tumor patients could be found for 7 series. (Significant at

the 5%-level). The reason for no statistically significant differences in the remaining four series are less than optimum sample conditions: e. g. TMRP-measurement later than 10 hours after the operation. The tumor values are higher than the normal values of non-tumor patients, possibly due to abnormally increased metabolism of the tumor cells (Fig. 2).

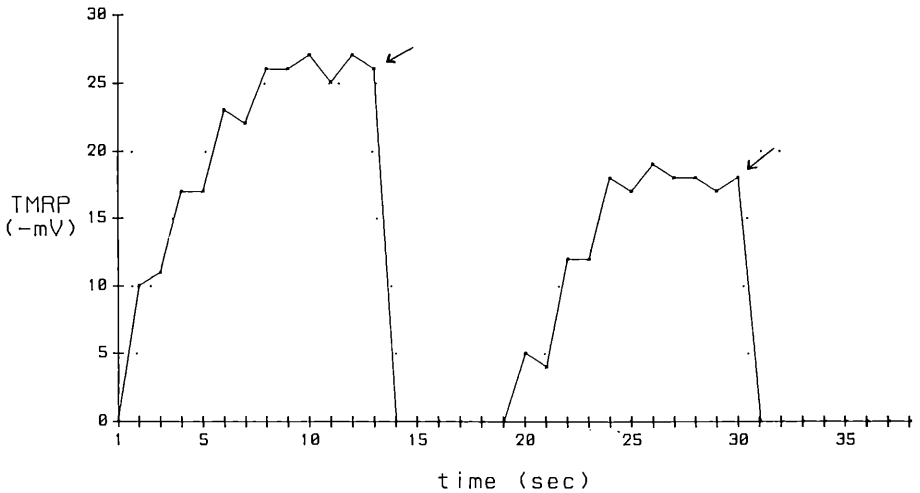


Fig. 1: TMRP-measurements of tissue samples (electrode removal).

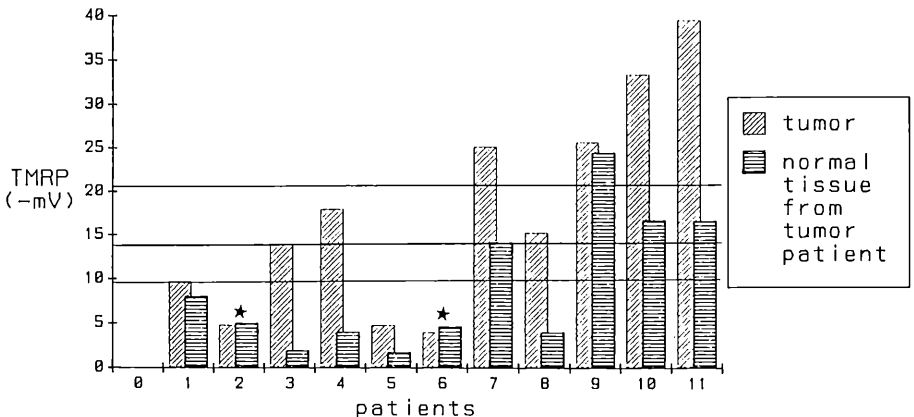


Fig. 2: TMRP-values of tumor tissue and normal tissue from tumor patients, compared to the median normal tissue values of patients with non-malignant diseases (-); samples damaged (*).

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Zeitschrift/Journal: [Berichte der Naturwissenschaftlich-Medizinischen Vereinigung in Salzburg](#)

Jahr/Year: 1988

Band/Volume: [9](#)

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Artikel/Article: [ELECTROPHYSIOLOGICAL MEASUREMENTS OF TUMOR AND NORMAL TISSUE. 175-176](#)