Aneuploid DNA Pattern in Human Pituitary Adenomas*

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Summary. The DNA contents of 29 histologically and ultrastructurally benign pituitary tumours were analyzed with flow-cytofluorometry. Cytogenetic malignancy, i.e., aneuploidy, was found in 12 cases, independent of endocrinological type of tumour. In 17 cases a diploid DNA content occurred. In aneuploid tumours varying percentage of cells in S-phase was found indicating different growth patterns. Aneuploid DNA pattern was often found in young patients with a short case history. Our findings indicate that analysis of cellular DNA content may reflect the biological properties of pituitary tumours, independent of morphologic characteristics and type of hormone secretion.

Key words: Pituitary tumours – DNA – Histopathology – Aneuploidy – Hormone secretion

The vast majority of pituitary tumours have traditionally been regarded as morphologically benign adenomas (Saeger 1975; Farmer 1979). Pituitary carcinomas are remarkably rare. Only approximately 20 cases are documented in the literature. Despite the morphological homogeneity of the pituitary tumours the postoperative results following their selective removal differ greatly. A great variation of the biological behaviour of the tumours occurs also within the same endocrinological type of adenoma (Kinnman 1973; Lüdecke et al. 1976; Roth et al. 1977). There is a correlation between nuclear DNA content and malignant characteristics of individual tumours. Benign tumours generally have a diploid DNA content like normal tissue (Figs. 1, 2, and 3a) (review: Böhm and Sandritter 1975; Sandberg 1980).

The present study was undertaken to analyze the DNA content of pituitary tumours and determine the percentage of cells in different phases of the cell

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Fig. 1. Schematic drawing showing how the DNA content varies during one normal cell cycle. This diagram shows the various phases of the cell cycle with the doubling of the chromosomes in the S-phase. Human cells, except mature sex cells, are normally diploid (2N; euploid) having 46 chromosomes. During cell proliferation the diploid DNA content with 46 chromosomes doubles to 92 chromosomes (S-phase). Cells with 92 chromosomes are tetraploid (4N). By mitosis the chromosome number is again reduced to 46 (2N)

Fig. 2. Schematic drawing illustrating the distribution (percentage) of cells in various phases of the cell cycle with regard to the two concepts "diploid" and "aneuploid" as found by DNA measurements. In normal tissue the majority of cells are diploid and in the G1 phase. Depending on the proliferation rate, different amounts of cells are found in S- and G2-phase. In aneuploid cell populations the number of chromosomes, i.e., the DNA content, deviates from 2N. This is often found in malignant tumours.