

Scanning electron microscopic study of nasopharyngeal carcinoma

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Abstract

The study has been carried out on biopsies taken from four patients affected by squamous cell carcinoma and four patients affected by undifferentiated carcinoma of nasopharyngeal type (UCNT). Three healthy volunteers have served as controls.

All the specimens have been studied by SEM. The neoplastic conditions cause obvious alterations both in the mucosal surface and in the morphology of the cellular apex.

Introduction

This paper deals with the appearance of nasopharyngeal carcinoma as studied by scanning electron microscopy (SEM).

There have been different approaches to the study of the nasopharyngeal epithelium both from the point of view of the morpho-functional interpretation of normal patterns (Ali, 1965; Bottazzi Bacchi, 1973; Gulisano *et al.*, 1988) and that of potential pathogenic agents (Henderson *et al.*, 1976; Torjussen *et al.*, 1979; Boysen and Reith, 1982a, b; Petruson *et al.*, 1984; Wilhelmsson *et al.*, 1985).

As far as neoplastic pathology is concerned much research has been carried out regarding both aetiology (Alajmo, 1988; Polli, 1989; Zampi and Bianchi, 1989) and histopathology classification (Easton *et al.*, 1980; Zampi and Bianchi, 1989). In this paper the classification of Micheau *et al.* (1986), which is frequently adopted nowadays, will be followed, subdivided into: (1) squamous cell carcinoma. (2) undifferentiated carcinoma of the nasopharyngeal type (UCNT).

Materials and methods

This study was carried out on eight male patients, ranging from 55 to 75 years of age, all of whom were biopsied during diagnostic tests for suspected carcinoma of the nasopharynx. All the patients had neoplasms between stages T₂ and T₃. For control purposes, biopsies were also taken from the nasopharynx of three healthy volunteers, ranging from 35 to 55 years of age.

Nasopharyngeal examinations and biopsies were carried out using a fibre-optic endoscope equipped with mechanical biopsy forceps.

A portion of the sample followed the usual histopathological diagnostic procedure, resulting in the diagnosis of squamous cell carcinoma (Fig. 10) in four subjects and UCNT (Fig. 11) in the other four subjects. The remaining part of the tissue was studied with a Scanning Elec-

tron Microscope (SEM) Stereoscan 100 (Cambridge), with accelerating voltage ranging from 15 to 25 Kv and tilt angle ranging from 0° to 45°.

Observations

Controls: the nasopharyngeal mucosa consists of three types of cell: ciliated cells, cells with microvilli and goblet cells. These cells are distributed on a rough surface due to the presence of grooves and folds (Fig. 1). Occasionally areas lined with squamous epithelium can be observed. Here the mucosal pattern appears to be simplified and much more level.

Squamous cell carcinoma: The surfaces examined showed less marked ridges and grooves and were lined by large flattened cells (Fig. 2) often irregularly arranged (Fig. 3). At higher magnification they appear larger than the normal elements, resembling syncytial types of cells. Their shape was very variable and occasionally wide, irregular cytoplasmic expansions were noted (Fig. 4). The cellular apices may show a complex network of often fragmented microplicae which frequently tend towards a kind of parallel arrangement. Occasionally scattered, short microvilli or bloated areas almost without apical specialization can be noted. (Fig. 5).

These observations can coexist on the same cell apex. In one specimen, bundles of exfoliated cells were observed suggesting the onset of keratinization (Fig. 6).

UNCT: The surface was extremely irregular, characterized by eroded, degenerated epithelium and covered by unclassifiable elements as far as shape, size or dimension were concerned (Fig. 7). The microvilli covering the cell apex showed varied shapes, often on a single cell (Fig. 8): Frequently apical protrusions similar to small pseudopodia protruded (Fig. 9).

Conclusions

The photographic results from healthy volunteers appear to be in agreement with published data.

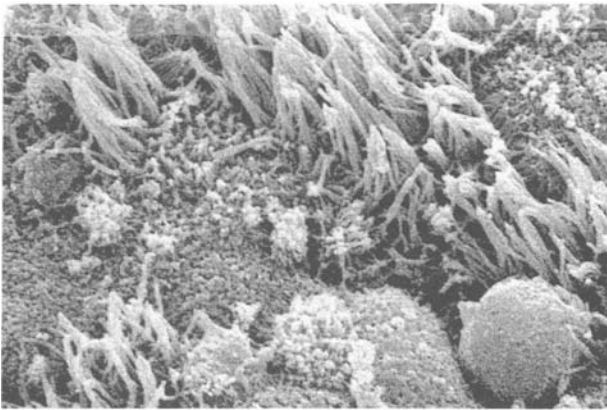


FIG. 1

Normal mucosa: ciliated cells, microvillous cells and goblet cells coexisting in a small area. $\times 2150$

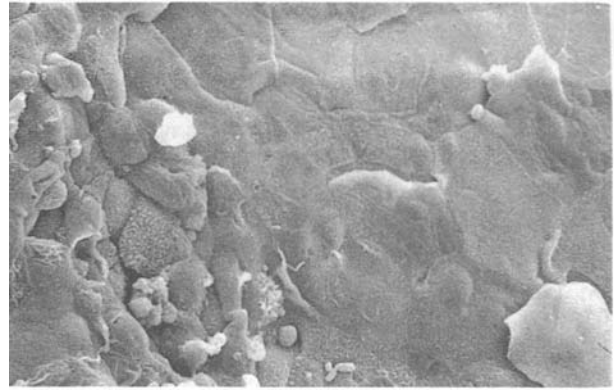


FIG. 2

Squamous cells carcinoma: flat elements covering the surface. $\times 650$

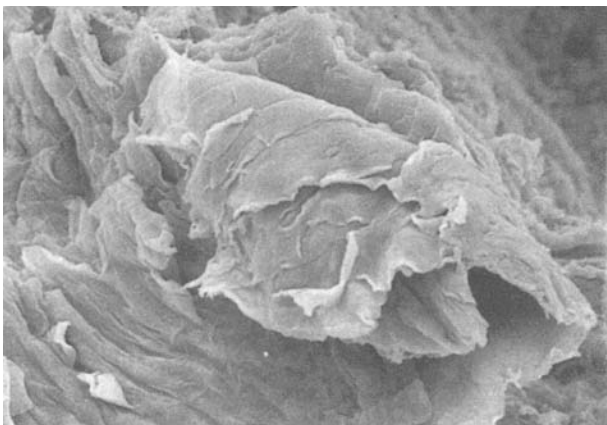


FIG. 3

A wave of exfoliated cells. $\times 220$

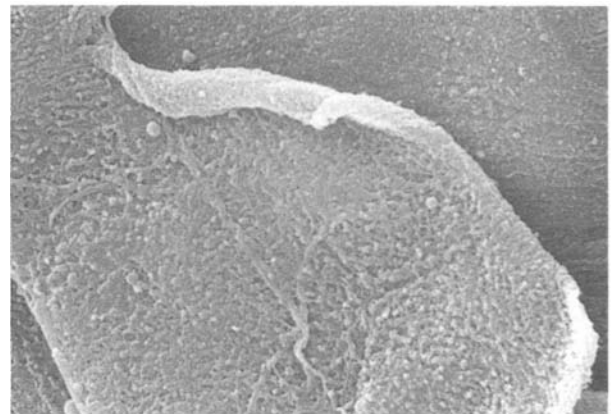


FIG. 4

A cell shows cytoplasmic expansion. $\times 2610$

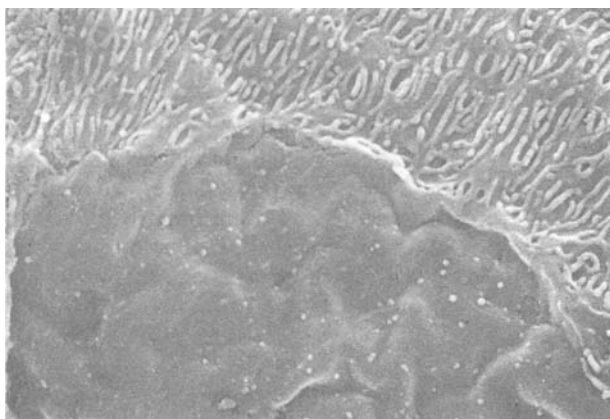


FIG. 5

Fragmented microplacae and microvilli on the cellular apices coexist with a smooth, probably degenerated area. $\times 5350$

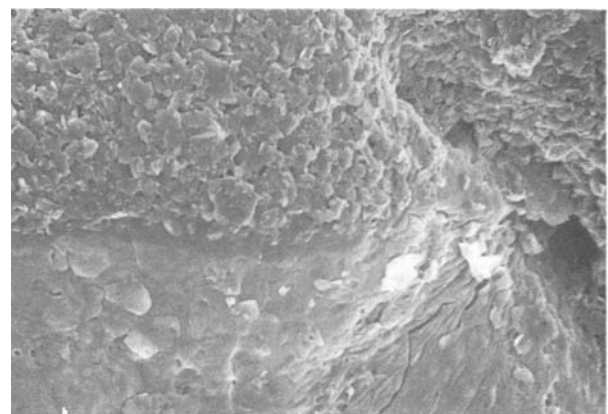


FIG. 6

The superior part of the feature shows a bundle of exfoliated, probably cornified, cells. $\times 180$

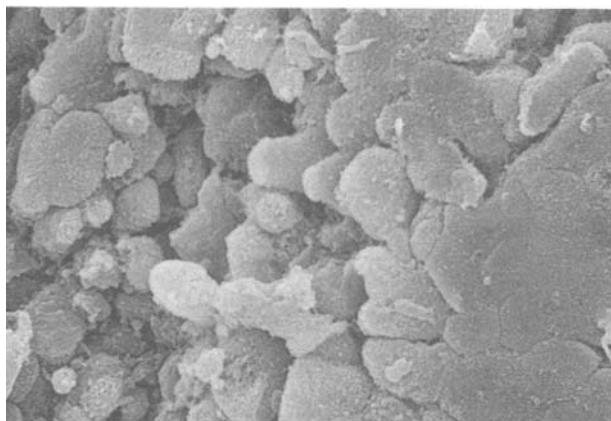


FIG. 7

UCNT: pleomorphic elements covering the surface. $\times 860$

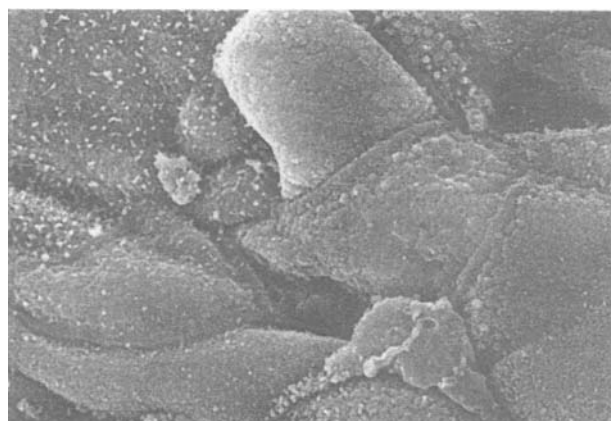


FIG. 8

Irregular shapes of the cells. $\times 1950$

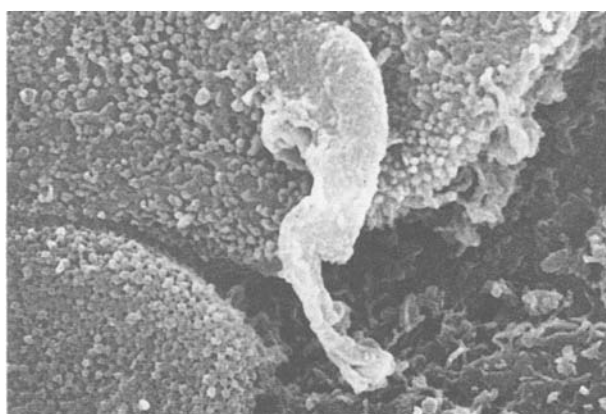


FIG. 9

Detail. An apical extrusion, similar to a small pseudopodium. $\times 5510$

Concerning squamous cell carcinoma, a peculiar morphological aspect of the epithelium seems to be the appearance (extremely variable in shape) of large-sized cells, frequently exfoliated. It must be noted that the network of microplicae (Nettersheim *et al.*, 1981; Zampi and Bianchi, 1989) characterizing the cell apices in such metaplastic areas, is similar to that described in the surface cells of squamous cell carcinoma (Gulisano *et al.*,

1988). The latter is, nevertheless, differentiated, being arranged irregularly and sometimes fragmented. Keratinization phenomena are in agreement with descriptions reported by others using light and transmission electron microscopy (Micheau *et al.*, 1986; Zampi and Bianchi, 1989).

The feature that characterizes UCNT is the marked architectural irregularity of the mucosa and the

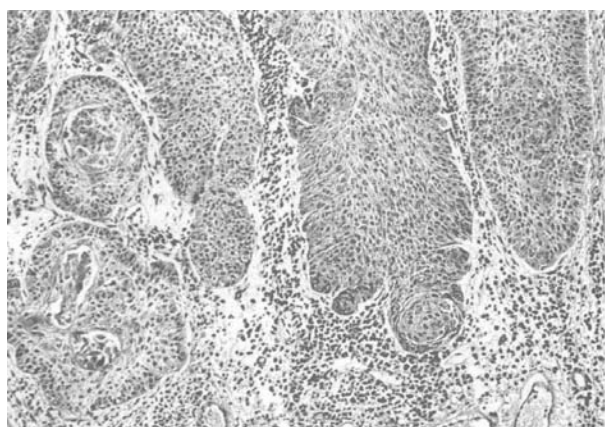


FIG. 10

Squamous cells carcinoma by light microscopy. $\times 100$

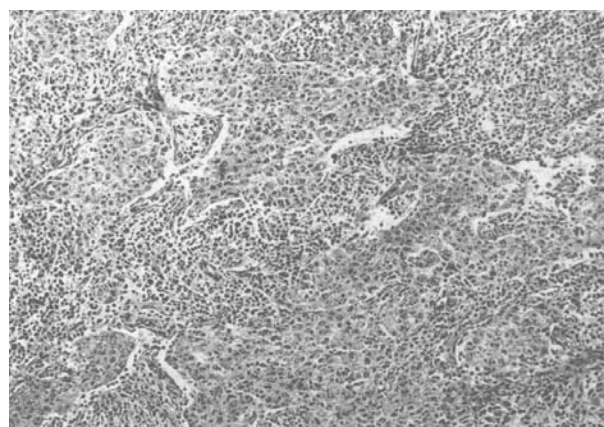


FIG. 11

UCNT by light microscopy. $\times 100$

increased polymorphism of its cells. The latter, which is especially evident on the apical microvilli is considered by many to be the true morphological marker of this histotype (Zampi and Bianchi, 1989).

The application of SEM has proved helpful in providing some evidence of the modification of the epithelium elements particularly evident at the cell apex.

References

- Alajmo, E. (1988) Otorinolaringoiatria, 1st Edn., Piccin, Padova pp. 383–413.
- Ali, M. Y. (1965) Histology of the human nasopharyngeal mucosa. *Journal of Anatomy*, **99**: 657–672.
- Andrews, P. M. (1974) A scanning electron microscopy study of the extrapulmonary respiratory tract. *American Journal of Anatomy*, **139**: 399–424.
- Bottazzi Bacchi, A. (1973) Osservazioni sulla struttura del rinofaringe nell'Uomo. *Archivio Italiano di Anatomia ed Embriologia*, **78**: 1–21.
- Boysen, M., Reith, A. (1982a) The surface structure of the human nasal mucosa II. Metaplasia, dysplasia and carcinoma in nickel workers. A correlated study by scanning/transmission and light microscopy. *Virchow's Archiv. Section B. Cell Pathology*, **40**: 295–309.
- Boysen, M., Reith, A. (1982b) Stereological analysis of nasal mucosa. III. Stepwise alterations in cellular and subcellular components of pseudostratified, metaplastic and dysplastic epithelium in nickel workers. *Virchow's Archiv. Section B, Cell Pathology*, **40**: 311–325.
- Easton, J. M., Levine, P. H., Hyams, V. J. (1980) Nasopharyngeal carcinoma in the United States. *Archives of Otolaryngology, Head and Neck Surgery*, **106**: 88–91.
- Gulisano, M., Polli, G., Pacini, P. (1988) Study of the nasopharynx in man by scanning electron microscopy. *Journal of Laryngology and Otology*, **102**: 902–905.
- Henderson, B. E., Louie, E., Jing, J. S. H. (1976) Risk factors associated with nasopharyngeal carcinoma. *New England Journal of Medicine*, **295**: 1101–1106.
- Jahnke, V. (1974) Elektronenmikroskopische befunde am normalen menschlichen Nasenrachenepithel. *Laryngologie, Rhinologie, Otologie*, **53**: 290–300.
- Micheau, C., Rilke, F., Pilotti, S. (1986) Proposal for a new histopathological classification of the carcinoma of the nasopharynx. *Tumori*, **64**: 513–518.
- Nettesheim, P., Klein-Szanto, A. J. P., Marchok, A. C., Steele, V. E., Terzaghi, M., Topping, D. C. (1981) Studies of neoplastic development in respiratory tract epithelium. *Archives of Pathology and Laboratory Medicine*, **105**: 1–10.
- Petruson, B., Hansson, H. A., Karlsson, G. (1984) Structural and functional aspects of cells in the nasal mucociliary system. *Archives of Otolaryngology*, **110**: 576–581.
- Polli, G. (1989) Note di epidemiologia del carcinoma rinofaringeo. Rapporti fra carcinoma rinofaringeo e virus di Epstein-Barr. In *Il carcinoma rinofaringeo* (Alajmo, C., ed.), Pacini Editore, Rieti.
- Torjussen, W., Solberg, L. A., Hogetveit, A. C. (1979) Histopathological changes of the nasal mucosa in active and retired nickel workers. *British Journal of Cancer*, **40**: 568–580.
- Wilhelmsson, B., Hellqvist, H., Olafsson, J., Klintonberg, C. (1985) Nasal cuboidal metaplasia with dysplasia. *Acta Otolaryngologica*, **99**: 641–648.
- Zampi, G., Bianchi, S. (1989) Anatomia patologica del carcinoma rinofaringeo. In *Il carcinoma rinofaringeo* (Alajmo, E., ed.), pp. 37–56, Pacini Editore, Rieti.

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Key words: Nasopharyngeal neoplasms; Scanning electron microscopy