Tumours of salivary tissue

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SYNOPSIS A clinical study of 401 cases of tumour of salivary tissue has been made and the results reported, together with a review of the literature. The histological variations of such tumours are classified and discussed.

Since the first attempt by Bérard (1841) tumours of salivary tissue have not been satisfactorily classified either clinically or pathologically. Attention has been focused mainly on the so-called 'mixed tumours', and other varieties have often been neglected. The classification used throughout this paper is a modification of that of Willis (1953) and the classification together with the number of cases is shown in Table I.

TABLE I
CLASSIFICATION OF SALIVARY TUMOURS

Type	No.
I Simple adenoma	—
II Pleomorphic adenoma	315 (78.5%)
III Carcinoma	64 (16%)
IV Adenolymphoma	16 (4%)
V Miscellaneous	6 (1.5%)
Total	401 (100%)

TYPE 1: SIMPLE ADENOMA

The term 'adenoma' was introduced by Lebert and Broca (1850) for benign tumours of the parotid gland. It is generally agreed that there is no sharp line of demarcation on structural grounds between the simple adenoma and the pleomorphic adenoma. According to Willis (1953), pure adenomas are slowly growing, encapsulated, lobulated, epithelial tumours. They may, however, be only a variant of the whole group, namely, the most slowly growing and innocuous variety with a uniformly differentiated structure. Some 40 cases have been described in the European literature; the first in the British literature was by Dunlop (1879) in a 36-year-old woman at the Glasgow Royal Infirmary.

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No case of simple adenoma was observed in this series as the distinction between simple adenoma and pleomorphic adenoma is so artificial that the first two types can be grouped together. With this in mind, only the last four types of salivary tumours will be considered.

TYPE 2: PLEOMORPHIC ADENOMA

Pleomorphic adenoma is a bizarre lesion which accounts for the vast majority of all salivary tumours. There are in this series 315 examples, constituting 78.5% of the total. Although the first published reports of such tumours are generally credited to C. G. Siebold (1793) and J. B. Siebold (1797) little of morphological interest has been added since 1853, when it was recognized as a clinical entity by Paget, and since Theodor Billroth wrote his classical thesis in 1859. The term 'mixed tumour' dates from Minssen's review in 1874. Many authors have reviewed the literature since Wood (1904), notable reviews being by Wilson and Willis (1912), Heineke (1913), Kennon (1921), and McFarland on numerous occasions (1926, 1933, 1936, 1942, 1943).

Fick (1909) and Patey (1930) rightly suggest that the confusion over terminology is due to the dispute as to its aetiology. For this reason such hyphenated monstrosities as chondro-myxo-haemato-endotheliosarcoma have been used. Most of the early German pathologists considered them of connective tissue origin and any epithelial structures as vestiges of the gland in which they occurred. In 1880 Wartmann expressed the opinion that they were derived from lymphatic endothelium. Volkmann (1895) thought that he had proved the endothelial origin as did Martini (1907), von Hansemann (1910), and others. This theory was adversely criticised by Hinsberg (1899) who, with Cunéo and Veau (1900), Wood (1904), Chevassu (1910), and Ssobolew (1912), suggested a branchiogenic origin and so explained the

TABLE II

SITES OF 315 PLEOMORPHIC SALIVARY ADENOMATA COMPARED WITH SERIES OF PREVIOUS WORKERS

Author(s)		Parotid	Submandibular	Sublingual	Palate	Lip	Miscellaneous	Total
Present series	R.	142	8	0				
	L.	123	11	1	14	9	7	315
	Total	265	19	1	14	9	7	315
Wood (1904)		35	13	0	3	4	4	59
Schreiner and Mattick (1929)		45	7	0	1	9	4	66
Patey (1930)		38	6	1	5	1	3	54
Zymbal (1933)		55	2	0	0	1	0	58
Harvey <i>et al.</i> (1938)		230	21	2	6	9	7	275
Willis (1953)		35	6	1	5	1	0	48
Ross (1955)		84	9	0	3	0	2	98

presence of 'cartilage' and 'bone'. Other suggested theories at this time included that of Forge and Massabuau (1908) that they should be classified as embryomata along with testicular tumours. Teratoma of the neck have been reported by McGregor and Workman (1906) and others, but these tumours are quite different. Another theory which did not get many supporters was that of Krompecher (1908) who regarded them as basal cell tumours. Wilms (1899), Marchand (1910), and others regarded them as tumours in which the epithelium plays the most important part. Fraser (1918) with his work on dogs believed he had experimental proof that they arose from the ducts of adult glands. He is supported by Fry (1927). McFarland (1926), supported by Kux (1931) and Hemplemann and Womack (1942), suggests that the origin is probably sequestration of embryonal cells. Many agree on the purely epithelial nature of the tumours (Fick, 1909; Böttner, 1921; Fry, 1927; Patey, 1930; Zymbal, 1933; Harvey, Dawson, and Innes, 1938; Muir, 1941) and others who have argued for an essentially epithelial origin have accepted without question the belief that they contain 'cartilage' and have devised various explanations of its origin. Harvey *et al.* (1938), however, suggest that it is not cartilage but pseudo-cartilage or a myxochondroid substance developed from epithelium and stroma by degeneration. The epithelial cells which are isolated in a retraction space in the acellular homogenous mucoid matrix give all the appearance of cartilage cells within their capsule. Fry (1927) suggests that a similar appearance is given by a ring of deeply staining mucin round isolated cells.

By far the majority of pleomorphic adenomata arise in the parotid gland, less commonly the submandibular, and rarely in the sublingual gland. They are, however, also found in the palate and various parts of the oral-facial region such as the lips, nose, pharynx, or lacrimal glands, arising probably from serous or mucous glands.

The site distribution reported by several workers is contrasted with the present series in Table II.

It will be seen that the parotid gland accounts for just over 80% of such tumours. Other series vary from 70% (Sirsat, 1953) to 98% (Montella and Fontana, 1956). Of these 265 tumours occurring in the parotid gland, 142 cases (53.6%) occurred on the right side; although not statistically proved, this slight preference for the right side agrees with the findings of Wilson and Willis (1912) and Benedict and Meigs (1930) while McFarland (1943) states that the left is more frequently involved. From these findings, however, there seems to be no preference for any side.

Submaxillary tumours have been specially considered by Chevassu (1910) and Dockerty and Mayo (1942) while S. Paget (1886), Eggers (1928), D'Aunoy (1930), Davis (1935), and Stobie (1935) discussed palatal tumours. Lacrimal gland tumours were considered by Verhoeff (1905) and those of the lip by J. Paget (1853) and more recently by Bernier (1946).

Most authors consider that the commonest age for the first appearance of the tumour is the third and fifth decade. McFarland (1926) considered 66% occurred before the age of 40 years and 90% before the age of 50 years. In this series almost 60% occurred before the age of 40 years and 90% before 60 years of age. Table III shows the distribution of

TABLE III

DECADE DISTRIBUTION OF AGES AT FIRST APPEARANCE OF THE TUMOUR

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	1	17	20	34	21	15	9	5	1	0	123
Female	3	21	41	46	40	26	12	2	1	0	192
Total	4	38	61	80	61	41	21	7	2	0	315

the age at the first appearance of the tumour in this series by decades. No age is exempt and it is not unusual in childhood. According to Byars, Ackerman, and Peacock (1957) 5% occur before the age of 18 years. Occasionally the condition is first encountered in infancy; Paillet (1903) reported a case of a mixed tumour in a child of 11 months, and

Wood (1904) in an infant of 7 months. Examples reported occurring in the first decade include those of Chevassu (1910) and Zymbal (1933) 9 years and Fry (1927) at 10 years, and Schilling (1921) reports a tumour occurring in a man aged 41 that had been present since he was 1 year old. McFarland (1942) out of 380 cases found eight occurring in the first decade. Of the four occurring in the first decade in the present series, the earliest age of first appearance of the tumour was 3 years, it being treated conservatively until the patient was 42 years of age. The remaining three tumours all appeared at 9 years of age with surgery being undertaken three, four, and five years later respectively. Most tumours exhibited a slow, intermittent growth and on an average six years elapsed from the time of first appearance until the initial operation. Table IV shows the decade

TABLE IV

DECADE DISTRIBUTION OF AGES AT TIME
OF FIRST OPERATION

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	0	10	17	27	28	18	13	9	0	1	123
Female	0	9	34	35	41	49	14	9	1	0	192
Total	0	19	51	62	69	67	27	18	1	1	315

distribution of the age at the time of the first operation in this series. The longest duration before the patient was subjected to surgery was 39 years, but Street (1913) and Ross (1955) report cases with intervals of 40 and 60 years respectively before the patient received surgery.

Although in recent years most reported series show a predominance of females (Table V), most

TABLE V

SEX DISTRIBUTION OF PLEOMORPHIC ADENOMATA IN
PRESENT SERIES COMPARED WITH FIGURES GIVEN BY
PREVIOUS WORKERS

Authors	Male	Female
Wood (1904)	25	21
Chevassu (1910)	30	27
Wilson and Willis (1912)	30	26
Böttner (1921)	10	15
Fry (1927)	11	14
Ahlbom (1935)	106	148
McFarland (1942)	184	212
Willis (1953)	16	34
Fitzgibbon (1953)	19	23
Present series	123	192

earlier workers stated that the sexes showed little difference in their liability to pleomorphic adenomata of salivary tissue.

The largest tumour on record seems to be that reported by Cotterill (1907) which is said to have been twice the size of a man's head and to have weighed approximately 26 lb. (Fig. 1). As these

FIG. 1. Photograph of Cotterill's case. (By permission of the publishers, W. Green & Son, Ltd., Edinburgh.)

tumours have in the past received only a passing mention, details were often scanty and the weight, when it was mentioned, was not necessarily accurate. Witness Keen's (1904) case in which the tumour was said to be 7 lb., the excised tumour weighing 4½ lb. at operation but an allowance of 2 lb. was made for the fluid lost when the tumour was 'burst' a year before the operation. Amongst the largest surgically treated and confirmed histologically as mixed are those shown in Table VI. The patient of Short and Pullar (1956) is included in this series (Case 221) as she had been treated at the Glasgow Royal Infirmary between 1935 and 1956.

Opinions vary as to the rate of recurrence; for example, Wood (1904) 30%, Benedict and Meigs (1930) 42.5%, Stein and Geschickter (1934) 20% and McFarland (1942) 25%. Recurrences are seen more commonly in the parotid tumours, possibly because of anatomical relations (Patey, 1940). In this series the recurrence rate was 29.5%, and the details of these recurrences together with their sites are seen in Table VII. The average interval between the original operation and subsequent excision in this series was four years.

TABLE VI

OTHER GIANT PAROTID TUMOURS CLASSIFIED HISTOLOGICALLY AS 'MIXED'

Authors	Weight (kg.)	Size	Sex and Age (yr.) at Onset	Duration (yr.)
Spence (1863)	3.1	9½ × 8½ × 7½ in.	F. 18	16
Rouville and Martin (1904)	2.95	—	F. 14	30
Ahlbom (1935)	2.25	—	F. 30	17
Frazell (1954)	1.27	22 cm. diam.	F. 38	6
Cade (1954)	1.99	19 × 15 × 13 cm.	M. 54	18
Short and Pullar (1956)	2.8	30 cm. diam.	F. 33	16

TABLE VII

RECURRENCE RATE OF PLEOMORPHIC ADENOMATA AT SITES OF ORIGIN

	Parotid	Submandibular	Sublingual	Palate	Lips	Miscellaneous	Total
Recurrences	78	7	1	2	1	4	93
Non-recurrences	187	12	0	12	8	3	222
Total	265	19	1	14	9	7	315

Although no reference could be found of any previous report of pleomorphic adenomata affecting more than one member of a family, a familial incidence was found in this series on three occasions (Cameron, 1959). Likewise a highly significant percentage of the patients with pleomorphic adenomata in this series belong to blood group A (Cameron, 1958).

Reference has already been made to the varied structure of pleomorphic adenomata and now only

the commonest variations which were encountered will be shown. The findings accord with the descriptions of the earliest workers, in particular of Zymbal (1933) and of Willis (1953), the former giving by far the best account of the microscopical structure of salivary tumours. In some tumours, many or all the possible variations of structure may be found in juxtaposition with all gradations between them; while in others, one or another structural variant predominates.

The atypical glandular structure is seen in a great variety of forms. They may be acinar or ductular in type, cystic or papillary, and they may contain mucoid or hyaline material. Predominance of the goblet-cell epithelium is sometimes seen, as in the cases of Schilling (1921), Lepp (1939), De and Tribedi (1939), Škorpil (1940), Linell (1948), and Cooray, Tennekoon, Kanakarathne, and Attygalle (1950). On occasion it is associated with squamous-cell epithelium and some workers believe that such tumours form a distinct group, namely the 'muco-epidermoid' tumours, and state that they account for approximately 50% of salivary tumours. According to Du Plessis (1957), in 28% of normal parotid glands, sebaceous glands may arise from the parotid ducts, thus explaining the site of origin of such muco-epidermoid tumours.

The classical ductular type is seen in Fig. 3 while a relatively common pattern (Fig. 4) is that in which the glandular tissue merges into the mucinous matrix. This finding is well described by Zymbal (1933), and is shown by epithelial sprouting from the glandular formations. This fraying out of the epithelium is a common way of development of the so-called 'mucoid tissue'. A feature not uncommonly encountered is the presence of extensive areas of squamoid change (Fig. 5).

Many tumours contain a fairly solid glandular

FIG. 2. Case recorded by Short and Pullar in 1956 (Case 221 in this series).

FIG. 3. *Photomicrograph showing a glandular type of pleomorphic adenoma. Haematoxylin and eosin $\times 200$.*

FIG. 4. *The glandular tissue is merging into the mucoid matrix. Haematoxylin and eosin $\times 770$.*

FIG. 5. *A high-power view showing extensive area of squamoid change. Haematoxylin and eosin $\times 800$.*

epithelium. The case illustrated in Fig. 6 was the only one in the series which bore any resemblance to simple adenoma. In solid epithelial tumours of this type the glandular structures may be arranged in tubular or cylindromatous fashion (Fig. 7) or acinar formation (Fig. 8). In large epithelial masses rounded or irregular spaces may appear, chiefly by secretory products of the cells collecting. Sometimes the secretory spaces assume a characteristic structure, cribriform in type (Fig. 9), which resembles that seen in mammary tumours (Willis, 1953).

The proportions of the epithelial elements to the matrix is very variable and a case previously described as 'myxo-chondroid' where the matrix reveals its looseness with stellate cells is seen in Fig. 10. A frequent finding in many tumours is the presence of areas of 'pseudo-cartilage' (Fig. 11) and in rare cases even bone (Allen, 1940; Yates and Paget, 1952). It is my belief that cartilage and even bone do occur in pleomorphic adenomata on occasion, although probably not as frequently as the pseudo-cartilage so commonly talked about.

TYPE 3: CARCINOMA

As Fry (1927) suggests, there are varying degrees of malignancy and there is again no sharp line of demarcation between an unusually active pleomorphic adenoma and frank carcinoma. The incidence, however, is higher than is generally appreciated, reports varying from 50% to 15%, although usually between 17% and 25%; in this series it accounts for 16% of the total of salivary tumours (Table VIII). On an average, according

TABLE VIII

PERCENTAGE INCIDENCE OF SALIVARY CARCINOMATA

Nasse (1892)	11
Wood (1904)	25
Kennon (1921)	22
Benedict and Meigs (1930)	42
Stein and Geschickter (1934)	15
Slaughter <i>et al.</i> (1953)	26
Ross (1955)	22.8
Present series	16

to Foote and Frazell (1954), the age incidence is 10 years older than in pleomorphic adenomata, while Quattlebaum, Dockerty, and Mayo (1946) give the average age as 49.8 years. Dick (1954),

however, reported a case of a small-cell carcinoma arising in the left cheek of a 2-day-old boy. In this series the commonest age of the first appearance of the tumour is between the fifth and eighth decades (Table IX). In view of the more rapid increase in size and the associated symptoms of pain and/or paralysis, there is a shorter interval before the patient receives treatment, in this series two to three years on an average (Tables IX and X).

TABLE IX

DECADE DISTRIBUTION OF AGE AT ONSET OF SALIVARY CARCINOMATA

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	1	3	2	1	8	9	7	7	1	0	39
Female	1	1	3	0	3	5	8	4	0	0	25
Total	2	4	5	1	11	14	15	11	1	0	64

TABLE X

DECADE DISTRIBUTION OF AGE AT TIME OF FIRST OPERATION FOR SALIVARY CARCINOMATA

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	0	1	1	3	5	10	9	9	1	0	39
Female	0	2	0	2	1	5	9	6	0	0	25
Total	0	3	1	5	6	15	18	15	1	0	64

Like other tumours of salivary tissue, the parotid gland is the commonest site (Sirsat, 1953), followed by the submandibular and sublingual glands, the palate being an intermediate site (Table XI). There would appear, in this series, to be no preference for side, and, as according to rule, bilateral salivary carcinomata were not encountered. In series of malignant salivary tumours there appears to be a slight predominance of males (Table XII) although the difference does not appear to have been as marked in previous reviews.

According to Redon (1953) less than 10% survive five years after receiving treatment. In this series, recurrences were noted in 56 of the 64 cases (Table XIII) and in the remainder, death had occurred in four very shortly after operation due to other causes. The histological study of salivary carcinomata presents little difficulty in diagnosis, as the tumours are invasive from the start. A typical carcinoma of salivary origin is shown in Fig. 12 where it arose in the parotid gland. A statistically significant increase

TABLE XI

SITE DISTRIBUTION OF SALIVARY CARCINOMATA

	Parotid	Submandibular	Sublingual	Palate	Lips	Nose	Tongue
Right	24	3	0	6	1	1	1
Left	23	4	1				
Total	47	7	1	6	1	1	1

FIG. 6

FIG. 7

FIG. 8

FIG. 9

FIG. 6. A fairly solid glandular epithelium. Haematoxylin and eosin $\times 100$.

FIG. 7. Photomicrograph of a tubular or cylindromatous type of pleomorphic adenoma. Haematoxylin and eosin $\times 180$.

FIG. 8. A more acinar formation. Haematoxylin and eosin $\times 90$.

FIG. 9. A cribriform pattern. Haematoxylin and eosin $\times 190$.

FIG. 10. Stellate cells in a loose matrix. Haematoxylin and eosin $\times 450$.

FIG. 11. Areas of 'cartilage' in a pleomorphic adenoma. P.A.S. $\times 500$.

FIG. 10

FIG. 11

TABLE XII

SEX DISTRIBUTION OF SALIVARY CARCINOMATA IN THIS SERIES AT SITES OF ORIGIN

	Parotid	Submandibular	Sublingual	Palate	Lips	Nose	Tongue	Total
Male	27	6	0	5	0	1	0	39
Female	20	1	1	1	1	0	1	25
Total	47	7	1	6	1	1	1	64

TABLE XIII

RECURRENCE RATE IN SALIVARY CARCINOMATA IN RELATION TO SITE OF ORIGIN

	Parotid	Submandibular	Sublingual	Palate	Miscellaneous	Total
Recurrences	41	5	1	6	3	56
Non-recurrences	6	2	0	0	0	8
Total	47	7	1	6	3	64

In four of the eight non-recurrences, death occurred shortly after the first operation due to natural causes.

in the number of patients with salivary carcinomata belonging to blood group A was again noted (Cameron, 1958).

TYPE 4: ADENOLYMPHOMA

This group of tumour is of a class unto themselves and occupy about 4% of salivary tumours in this

FIG. 12. Salivary carcinoma of the parotid gland. Haematoxylin and eosin $\times$ 200.

series. Various names have been applied to them including among others papillary cystadenoma lymphomatosum, branchiogenic cystadenoma lymphoma, onkocytoma, and Warthin's tumour. They were first reported in 1898 by Hildebrandt but were only established as a distinct morphological entity in 1910 by Albrecht and Arzt, being composed mainly of epithelial and lymphoid tissue in or near the parotid. Nicholson (1923) reported the first case in the British literature. As with pleomorphic adenoma various theories as to their origin have arisen, a noteworthy one being that the tumour is branchiogenic, suggested by Ssobolew (1912) and supported by others, although not in vogue today. Another suggested by Warthin (1929), after whom the tumour is sometimes called is that they arise from the epithelium of embryonic pharyngeal endoderm or the upper respiratory tract displaced to the region of the parotid. Among those supporting this theory are Gaston and Tedeschi (1946), Rawson and Horn (1950), Robinson and Harless (1943), and Kraissl and Stout (1933). A third, more acceptable, theory, originally suggested by Albrecht and Arzt (1910) and recently supported by Harris (1937) and Martin and Ehrlich (1944), is that they represent heterotopic salivary gland rest situated in lymph glands adjacent to or in the parotid. Jaffé (1932) pointed out that such tumours are usually situated on the external surface of the gland although the capsule of the tumours may fuse with the capsule of the gland. He regarded lymph tissue as not an essential part of the tumours but merely as a remnant of a lymph node. Yet another theory was postulated by Thompson and Bryant (1950) who made an extensive study of the subject and on their findings relate the tumours to 'neoplastic proliferation of the parotid ducts included in lymph glands'. Hamperl (1931) suggested the oncocytes as the site of origin, but Ackerman (1943) considered oncocytomata as a different entity from

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adenolymphomata. Meza-Chávez (1949), however, showed the occurrence of oncocytes in normal parotid glands.

Adenolymphomata are rarely found in sites other than the parotid gland (Plaut, 1942). In the present series all but one of the 16 tumours occurred in the parotid gland; the one exception occurred in the right tonsil. Only a few bilateral cases have been reported (Nino, 1940; Oughterson, 1941; Ramage, Binnie, and McCall, 1943; Lederman, 1943; Martin and Ehrlich, 1944; Lawrence and Procita, 1948; Foote and Frazell, 1953; and Schulenburg, 1954). In this series, bilateral adenolymphomata were found in four cases; of the remainder, seven occurred in the left parotid and four in the right parotid gland. They can occur at any age, but are generally encountered in the seventh decade. Not a single case was found in the first three decades of life in this series. The age distribution at the onset and at the time of first operation is shown in Tables XIV and XV. Plaut (1942) gives the figure as 84% occurring

TABLE XIV

DECADE DISTRIBUTION OF AGE AT FIRST
APPEARANCE OF ADENOLYMPHOMATA

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	0	0	0	1	1	1	3	2	0	0	8
Female	0	0	0	2	1	2	1	2	0	0	8
Total	0	0	0	3	2	3	4	4	0	0	16

TABLE XV

DECADE DISTRIBUTION OF AGE AT TIME OF FIRST
OPERATION FOR ADENOLYMPHOMATA

Decade	1	2	3	4	5	6	7	8	9	10	Total
Male	0	0	0	1	1	0	3	2	1	0	8
Female	0	0	0	1	1	1	3	2	0	0	8
Total	0	0	0	2	2	1	6	4	1	0	16

after the age of 40 years. The youngest case recorded is in a boy aged 2½ years (Stöhr and Risak, 1926) and the oldest in a man aged 92 (Carmichael, Davie, and Stewart, 1935). The findings of previous workers that these tumours were commoner in females was not shown in this series (Table XVI). They are well encapsulated and rarely malignant, malignant changes having been recorded in only five cases (Ssobolew, 1912; Stöhr and Risak, 1926; Lederman, 1943; Lloyd, 1946; and Gaston and Tedeschi, 1946).

There were no recurrences noted in any case to date and no case in this series was reported as malignant. The histological pattern of salivary adenolymphomata is characteristic. The tumours are frequently cystic in appearance (Fig. 13) and show a branching papillary structure with intervening collections of small lymphocytes. Fig. 14 shows an

TABLE XVI

SEX RATIO OF ADENOLYMPHOMATA IN PRESENT SERIES
COMPARED WITH THAT IN PREVIOUS REVIEWS

Author(s)	Female	Male	Ratio
Carmichael <i>et al.</i> (1935)	24	4	6 : 1
Plaut (1942)	50	12	9 : 2
Martin and Ehrlich (1944)	20	2	10 : 1
Gaston and Tedeschi (1946)	73	17	9 : 2
Lloyd (1946)	5	1	5 : 1
Hevenor and Clark (1950)	19	1	19 : 1
Present series	8	8	1 : 1

adenolymphoma with more glandular tissue. In adenolymphomata a statistically significant increase in patients of blood group A was not established (Cameron, 1958) but the indications are that if the number of patients were increased significance would be established.

TYPE 5: MISCELLANEOUS TUMOURS

Numerous tumours have been reputed to have arisen in or adjacent to the salivary glands and in the past have been classified erroneously as sarcomatous tumours of salivary tissue. Other less common tumours to mention only a few, include neurofibroma (McFarland, 1926; Wheelock and Madden, 1949), lipomata (Dockerty and Mayo, 1942), rhabdomyomata (Prudden, 1883; Wood, 1904), leiomyomata (Wheelock and Madden, 1949), angiomas (McFarland, 1926; Wheelock and Madden, 1949), lymphangiomas (Kennon, 1921; Wheelock and Madden, 1949), and malignant melanomata (Rodriguez, 1890; Gilis and Godlewski, 1905; Haggard, 1919).

Haemangiomas, however, deserve brief comment. Usually of the hypertrophic variety and found in infants or children, they are the commonest cause of chronic unilateral parotid swelling in the first year of life. In the present series, only six tumours were included in this category. They included two melanomas, two reticulum cell sarcomas, a recurrent leiomyosarcoma, and a fibroma. All but the fibroma had recurred, and all the patients had died before the follow-up was possible.

CONCLUSIONS

From this survey it would appear that it is only necessary to classify tumours of salivary tissue as pleomorphic adenoma, carcinoma, and adenolymphoma. The type previously classified as simple adenoma is only a variety of pleomorphic adenoma, and so does not need a separate classification. Also the miscellaneous group of tumours hardly enter the survey as they are only rarities and can occur in almost any organ.

FIG. 13. *Adenolymphoma, rather cystic in appearance. Haematoxylin and eosin $\times 200$.*

FIG. 14. *Adenolymphoma in more glandular tissue. Haematoxylin and eosin $\times 100$.*

Pleomorphic adenoma form 80% of salivary tumours and 80% of the group occur in the parotid gland with a slight preference for the right side. It was also observed that 60% occurred before 40 years of age and 90% before the age of 60 years. It is agreed that such tumours show a slow intermittent growth and they can reach gigantic size. The recurrence rate of almost 30% is due to either the general habit of such tumours, being subjected to surgery before all the tumour nodules have joined together (?multicentric origin), or that surgery was not radical enough. It is my belief that such tumours should be looked upon as potentially malignant and radically excised.

In the histological study of salivary tumours, numerous sections must be examined in order to get a clear view of the predominant pattern. Much has been written on the presence of areas of 'pseudo-cartilage', and many deny the possibility of such a finding. In spite of having been unable to prove or disprove this theory by tests *in vitro* with radioactive sulphur (S^{35}) on slices of human salivary tumour, there would appear to be no reason why cartilage, or even bone on rare occasions, should not be seen on histological section. Whether the cartilage is present from the onset of the tumour, or that it arises by metaplastic change will be, for some time to come, a matter for research.

Carcinomata are usually heralded by a tumour showing a rapid increase in size with associated pain and/or paralysis in a patient in a slightly older age group. As would be expected, the recurrence rate is high, and the death rate equally raised.

Only 4% of the tumours in this series were classified as adenolymphoma, and all but one occurred in the parotid gland. According to Carmichael *et al.* (1935) no case of adenolymphoma can be diagnosed correctly before operation; this statement, however, is in my experience, inaccurate.

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