MALIGNANT NEOPLASMS OF THE UPPER RESPIRATORY TRACT IN THE YOUNG

REPORT OF NINE CASES

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The growing realization of the fact that malignant tumors in the young are not a rare phenomenon prompted us to investigate their incidence in a series of 3,161 malignant neoplasms which had been treated in the Radiation Therapy Department of Bellevue Hospital during the years 1925 to 1932. Of these, 77, or 2.5 per cent, were found in patients twenty years of age and under.

Table I: Malignant Neoplasms in the Young

<table>
<thead>
<tr>
<th>Age</th>
<th>Carcinoma</th>
<th>Sarcoma</th>
<th>Lymphoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>4</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>6-10</td>
<td>4</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>11-15</td>
<td>5</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>16-20</td>
<td>7</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>21</td>
<td>36</td>
</tr>
</tbody>
</table>

There were 301 malignant lesions involving the oral cavity and upper respiratory areas, the age distribution being shown in Table II.

Table II: Age Incidence of Oral Cancer

<table>
<thead>
<tr>
<th>Ages</th>
<th>Carcinoma</th>
<th>Sarcoma</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-20</td>
<td>5 (1.6%)</td>
<td>4 (1.4%)</td>
<td>9 (3.0%)</td>
</tr>
<tr>
<td>21-40</td>
<td>15 (4.9%)</td>
<td>8 (2.6%)</td>
<td>23 (7.5%)</td>
</tr>
<tr>
<td>41-60</td>
<td>178 (55.0%)</td>
<td>5 (1.6%)</td>
<td>183 (56.6%)</td>
</tr>
<tr>
<td>61-80</td>
<td>83 (27.0%)</td>
<td>3 (1.0%)</td>
<td>86 (28.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>281</td>
<td>20</td>
<td>301</td>
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</tbody>
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Malignant disease in the mouth occurred in 9 patients between the ages of one and twenty years, or in 3 per cent of the total number of 301 oral lesions seen.

Individual cases of cancer of the mouth in the young have been reported by Garlick (1), Harrison (2), Weller (3), Hayward and Henderson (4), Whiteford (5), Morestin (6), Maubert and Pagniez (7), Massabuau and Oeconomos (8), and Variot (9). In their review of 16,565 cases seen at Memorial Hospital, Pack and LeFevre (10) found 37 instances of malignant lesions in the upper respiratory passages in patients under the age of twenty. Pearl and Bacon (11) reviewed 6,670 autopsies at the Johns Hopkins Hospital, and found 49 malignant tumors in patients under the age of twenty. No carcinomas were
found in the upper respiratory tract, and the sarcomas were not allocated in detail. Helmolz (12) studied 750 malignant tumors in children seen at the Mayo Clinic, and found 56 in the intra-oral and neighboring regions. Five of these were squamous-cell carcinomas.

The 9 cases here reported include 3 spindle-cell sarcomas involving the floor or the mouth, cheek, and soft palate respectively; a lymphosarcoma of the antrum; 3 epitheliomas of the nasopharynx and 2 of the tonsil.

![Image]

FIG. 1. **CASE 1: SPINDLE-CELL SARCOMA OF THE FLOOR OF THE MOUTH**
A. Appearance on admission, showing mass in floor of mouth displacing the tongue.
B. Recurrence in mouth and submental area.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Sex</th>
<th>Location</th>
<th>Diagnosis</th>
<th>Treatment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>11</td>
<td>F.</td>
<td>Floor of mouth</td>
<td>Sarcoma</td>
<td>Excision, x-rays, radium</td>
<td>Died</td>
</tr>
<tr>
<td>II</td>
<td>13</td>
<td>M.</td>
<td>Cheek</td>
<td>Sarcoma</td>
<td>X-rays, radium</td>
<td>Well 2 yrs.</td>
</tr>
<tr>
<td>III</td>
<td>19</td>
<td>F.</td>
<td>Palate</td>
<td>Sarcoma</td>
<td>Excision, radium, x-rays</td>
<td>Died</td>
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<tr>
<td>IV</td>
<td>7</td>
<td>F.</td>
<td>Antrum</td>
<td>Lymphosarcoma</td>
<td>X-rays</td>
<td>Died</td>
</tr>
<tr>
<td>V</td>
<td>13</td>
<td>F.</td>
<td>Tonsil</td>
<td>Squamous-cell epitheloma</td>
<td>X-rays, radium</td>
<td>Died</td>
</tr>
<tr>
<td>VI</td>
<td>14</td>
<td>M.</td>
<td>Tonsil, Testicle</td>
<td>Plexiform epithelioma</td>
<td>X-rays, radium</td>
<td>Died</td>
</tr>
<tr>
<td>VII</td>
<td>18</td>
<td>M.</td>
<td>Nasopharynx</td>
<td>Plexiform epithelioma</td>
<td>X-rays</td>
<td>Died</td>
</tr>
<tr>
<td>VIII</td>
<td>16</td>
<td>M.</td>
<td>Nasopharynx</td>
<td>Epidermoid carcinoma, Grade IV</td>
<td>X-rays</td>
<td>Died</td>
</tr>
<tr>
<td>IX</td>
<td>20</td>
<td>M.</td>
<td>Nasopharynx</td>
<td>Epidermoid carcinoma, Grade IV</td>
<td>X-rays</td>
<td>Untraced</td>
</tr>
</tbody>
</table>
CASE I: SPINDLE-CELL SARCOMA OF THE FLOOR OF THE MOUTH: A. C., a white female, aged eleven, was admitted to Bellevue Hospital in April 1929. Since the age of three, the patient had had a deformed tongue. It had given no symptoms, however, until five months before admission, when a painful swelling appeared in the floor of the mouth. This was shortly followed by a bulging beneath the chin. The patient did not appear ill, but spoke with great difficulty because of the mass in the oral cavity. Along the anterior left floor of the mouth was a hard, fixed, tender mass, which measured 3.5 cm. in diameter (Fig. 1A). In the anterior left submaxillary area was a hard, tender node of the same size as the oral tumor.

An incision was made in the floor of the mouth, and a solid homogeneous mass was found, which could not be enucleated. The mass in the neck was exposed by an incision 1 inch below the lower border of the mandible, and was found to be continuous with the mass in the mouth. A biopsy was taken, and surgical exploration was terminated.

Microscopic examination (Fig. 2) revealed a very cellular spindle-cell sarcoma. Relative to the amount of stroma, the cells were numerous, of small size, and closely packed in strands and whorls. The nuclei stained deeply, and there were occasional mitotic figures.

Following operation, 860 r units of high-voltage x-ray therapy were given to the right and left neck in four divided doses. This was followed by the insertion into the mass in the floor of the mouth of 12 needles containing 2 mg. of radium element each, filtered through 0.5 mm. of platinum. The radium was left in situ for seventy hours, giving a total dose of 1680 milligram hours.

After a moderate radium reaction, the lesion was somewhat reduced in size, but soon recurred. Seven weeks after the first radium treatment, 22 gold radon seeds were inserted into the mouth tumor, and 5 into the submental area, giving a total dose of 2100 millicurie hours in the mouth and 770 millicurie hours in the submental mass. Two months later, the lesion had regained its original size, and the submental mass had reached enormous proportions (Fig. 1B). Under general anesthesia, the tumor and slough in the floor of the mouth were excavated with endothermy, and 8 radium tubes of 5 mg. each were packed into the cavity. A dose of 2160 milligram hours was administered. The patient died several weeks later.
Comment: This very highly malignant spindle-cell sarcoma was quite radioresistant, responding only slightly and temporarily following each treatment.

![Image](image1.jpg)

**Fig. 3. Case 11: Spindle-cell Sarcoma of the Cheek, Before (A) and After (B) Treatment**

**Fig. 4. Case II: Malignant Tumor of the Cheek, Composed of Large Spindle Cells**

**Case II: Spindle-cell Sarcoma of the Cheek:** S. N., male, white, aged thirteen, was admitted to the Radiation Therapy Department in October 1930, complaining of a growth on the inside of the left cheek. Three weeks earlier the patient had noticed a
mass on the inner side of the left cheek, which grew rapidly and bled. Two days before admission a tooth was extracted from the left lower jaw. Examination revealed a flat, warty mass on the inside of the left cheek opposite the third lower molar (Fig. 3A). It measured 13 mm. in diameter, and 3 mm. in thickness. There were several small nodes palpable in the left side of the neck. A biopsy of the lesion showed a very cellular spindle-cell sarcoma (Fig. 4). The cells were arranged in strands with numerous small, young capillaries distributed throughout the stroma.

The left cheek was irradiated in divided doses with 860 $r$ units of high-voltage x-rays. Then, 7 platinum needles, containing 2 mg. radium each, were inserted around the lesion and left in place for ninety-six hours, to give a dose of 1344 milligram hours. Healing took place slowly, but there remained a persistent induration at the site of the original lesion. Another series of four x-ray treatments, totalling 860 $r$ units was administered to the left cheek. Two months later, a radium treatment was given with the one-gram pack, at 4 cm. distance, and 1 mm. platinum filtration, for a dose of 5,000 milligram hours. Five weeks after this last treatment the lesion had healed completely. In December 1932, two years after the first admission, a small white nodule was noticed at the site of the original lesion. This was removed and found to contain no signs of neoplasm. The patient has remained well up to the present time.

Comment: This patient fortunately appeared for treatment three weeks after the tumor was first noticed, and before it had metastasized. The tumor was small, the irradiation was instituted early, and was sufficiently destructive. These three very important factors contributed to a successful result.

CASE III: SPINDLE-CELL SARCOMA OF THE PALATE: J. C., female, white, aged nineteen, was admitted in November 1929, complaining of soreness over the left side of the gums and cheek. Two months before admission the patient noticed a mass over the inner aspect of the left superior alveolar ridge. The inner side of the left cheek became sore, and then the face became swollen. Upon examination, the local lesion was found to be a large tumor mass filling the left bucco-gingival groove. This mass was continuous with another on the posterior two thirds of the palate. Teeth impressions were visible in the tumor mass. A grayish membrane covered the entire growth, which was ragged, irregular, ulcerated, and friable. There was marked external bulging of the left cheek (Fig. 5). No nodes were palpable.
A biopsy was taken, and histologic examination revealed a cellular spindle-cell sarcoma, very vascular, and containing a large quantity of intercellular stroma (Fig. 6).

Treatment was given with high-voltage x-rays, 860 r units being given in divided doses over a period of ten days to the right and left neck. Following x-ray therapy, the lesion was removed by endothermy, under avertin anesthesia. The mass was found to involve the left soft palate and both inner and outer aspects of the left posterior upper alveolar ridge. Bleeding was very profuse. At the time of removal, 6 tubes, each containing 5 mg. of radium, filtered through 1.5 mm. of platinum, were placed longitudinally in the operative wound, and packed in situ with iodoform gauze. The dose given was 2800 milligram hours. Eleven days later a small nodule was observed in the posterior portion of the soft palate, and 10 gold radon seeds, each containing 1 millicurie of radon, were inserted into the mass, for a dose of 1400 millicurie hours.

Following the radium reaction, the lesion did not heal completely. A persistent slough on the anterior tonsillar pillar caused considerable pain and subsequent trismus. This was the condition when the patient died suddenly from pulmonary tuberculosis five months after treatment was commenced. This phthisis, which was present in other members of the family, was discovered early in the course of the illness.

Comment: This was a very rapidly growing lesion, as was evidenced by the fact that it reached a large size within two months.

Case IV: Lymphosarcoma of the Antrum: T. H., female, white, aged seven, was admitted in June 1927, complaining of a swelling over the right cheek. Ten months before admission the patient had noticed a hard, walnut-sized mass protruding from the anterior aspect of the maxilla, about half an inch from the infra-orbital border. Suspecting an abscess, her dentist extracted two teeth, but no pus was obtained. A biopsy was taken at another institution, and the patient was referred to our clinic for treatment. Examination revealed a diffuse swelling (Fig. 7) over the right cheek, with a palpable, localized, hard, tender, mass, 1.5 by 1 cm., just below the zygoma. In the mouth was visible a purplish discoloration of the mucosa opposite the upper right first molar and premolar regions. There were two swellings on the palate: one extending from the upper right first molar and premolar region to the midline and the other ex-
tending posteriorly to the soft palate. Both were hard and tender, but soft and compressible in the center.

A roentgenogram disclosed destruction of the outer and anterior walls of the right maxillary sinus. The blood count showed 13,500 leukocytes with 83 per cent lymphocytes.

The patient’s general condition was extremely poor; she received several x-ray treatments and died soon thereafter.

Post-mortem examination revealed a large, hard lymphomatous mass which involved the right maxilla, destroying its anterior and lateral walls, and bulging the cheek for 2 inches. A few small nodes were observed in the left upper neck. In addition, there were hypertrophy of the spleen and pyloric lymph nodes; lymphoid hyperplasia of the liver, lungs, and intestines; ulcerations of Peyer's patches; hemorrhages in the colon; an anemia of the skin and other organs. The nature of this lymphoid hyperplasia was lymphosarcomatous (Fig. 8).

**Comment:** The occurrence of a localized malignant lymphoma of a lymphosarcomatous nature, together with generalized lymphatic leukemia, is uncommon.

**Case V:** Squamous-cell Epithelioma of the Tonsillar Pillar; A. P., female, white, aged thirteen, was admitted in February 1928, complaining of a sore in the mouth. The condition began six months prior to admission, at which time the patient was conscious of a small mass in the left side of the mouth. It grew slowly but progressively, produced pain, and interfered with deglutition. A dentist had referred the child to another institution, where she received both x-ray and radium treatments. The lesion continued to grow, however, and upon examination there was visible in the region of the third left lower molar tooth, a large granulating ulcer with piled up, thickened edges, and a greenish necrotic base. It extended onto the adjacent anterior tonsillar pillar (Fig. 9).

A biopsy of the mass in the mouth was interpreted as giant-cell tumor. Several weeks later, a second biopsy showed a diffusely growing epidermoid carcinoma, Grade IV (Fig. 10). There was marked anaplasia of the cells, with irregularity in size and shape. The numerous multinuclear cells might readily be confused with giant cells. Many mitotic figures were present.
FIG. 8. CASE IV: POST-MORTEM SECTIONS SHOWING (ABOVE) LYMPH NODE INVAdED BY
LYMPHOSARCOMA AND (BELOW) SUBCUTANEOUS FAT INVAdED BY
LYMPHOSARCOMA CELLS

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Under avertin anesthesia, the tumor mass was resected by endothermy, and 20 gold seeds, of 1 millicurie of radon each, were inserted into the mass for a total dose of 2660 millicurie hours. When the local radium reaction subsided, the right and left sides of the neck were irradiated with deep x-ray therapy, 860 r units being given to each area. The lesion gave no evidence of response. The patient went down hill rapidly, and died seven weeks after the radium insertion. A roentgenogram taken during the period of x-ray treatment revealed a small, round, nodular mass at the left root of the lung, suggestive of beginning metastasis.

Comment: This very malignant neoplasm which failed to respond to irradiation elsewhere was hopelessly resistant to our additional therapy.

Case VI: Plexiform Epithelioma of the Tonsil and Embryonal Seminoma of the Testicle: E. S., male, white, aged fourteen, was admitted in May 1932, complaining of a sore throat of three months' duration, and difficulty in swallowing. The patient had had several attacks of sore throat, and went to a dispensary where the condition was
diagnosed as a peritonsillar abscess. Incision was done on two occasions but no pus was obtained. Subsequently the difficulty in swallowing increased.

The patient was a fairly well developed boy, chronically ill, speaking faintly, with a hoarse nasal twang, and complaining of continuous abdominal pain. The local lesion presented itself as a huge, bulky mass extending outward from the right tonsillar area, and almost touching the opposite side. It extended from the upper edge of the tonsillar fossa to the level of the epiglottis, and measured 4 cm. in the transverse diameter, and 6.5 cm. in the vertical diameter. The mass was ulcerated in four areas. On palpation, it was spongy and indurated. No cervical nodes were felt (Fig. 11). The right testicle was enlarged, measuring 6 by 4 by 4 cm., and was very hard, and opaque on transillumination. The epididymis was distinctly palpable as a separate mass. Roentgen examination revealed no metastatic foci.

A biopsy from the oral mass showed a plexiform epithelioma of the transitional-cell type.

X-ray therapy was administered to the right, left, and posterior areas of the neck, and to the abdomen, but because the patient's general condition was very poor, treatment was discontinued after one dose was administered. Eight days after admission, cyanosis and dyspnea developed, due to pharyngeal obstruction, and an emergency tracheotomy was done. Death occurred the following day.

Post-mortem examination revealed a plexiform epithelioma of the right tonsil with a few small metastatic cervical nodes (Fig. 12). Embryonal carcinoma of the right testicle with involvement of the right epididymis, and metastasis to the myocardium, heart, pancreas, kidneys, axillary, mediastinal and mesenteric lymph nodes were additional findings.

Comment: This very unusual case contributes to the increasing number of double malignant tumors reported. Both of these lesions, which are ordinarily radiosensitive, failed to respond in a patient whose health was rapidly undermined by metastases from the testicular tumor.

Case VII: Epithelioma of the Nasopharynx: A. L., male, white, aged eighteen, was admitted in April 1930, complaining of swelling of the right side of the neck. One year previously the patient fell, striking his head. He suffered with headaches for two months and then with sore throat. The latter condition abated, but was followed by a painful swelling on the right side of the neck. There was slight difficulty in breathing through the nose. A biopsy from the neck node, taken at another institution, was interpreted as tuberculosis. Because the swelling suggested malignant metastasis, another node was excised at Bellevue Hospital.

Microscopic examination of the excised lymph node (Fig. 13) revealed masses of epithelial cells which had almost completely displaced the lymphatic structure. The epithelial cells were large, pale staining, and arranged in a plexiform manner. The
FIG. 12. CASE VI: DOUBLE CARCINOMA IN A FOURTEEN-YEAR-OLD BOY, SEMINOMA OF TESTICLE (ABOVE) AND EPIDERMOID CARCINOMA OF THE TONSIL (BELOW)
nuclei were also pale, and finely granular. Many mitotic figures were visible. The
diagnosis was transitional-cell epidermoid carcinoma, Grade IV.

Examination of the neck showed a large mass of fixed, hard nodes at the angle of
the right jaw, surmounted by a recent healed incision. On the right lateral wall of the
nasopharynx, and extending on to the upper surface of the soft palate, were some neop-
plastic granulations.

The patient received only a few x-ray treatments, grew rapidly worse, and died
within several weeks.

Comment: This case is typical of the very highly malignant transi-
tional-cell epidermoid carcinomata of the pharynx which often exhibit
extensive metastases before the small local lesion can be found. It is
unfortunate that the first node was improperly diagnosed, since this
tumor is very radiosensitive, and treatment administered early might
have been effective.

Fig. 13. Case VII: Lymph Node Metastasis in Epidermoid Carcinoma of the
Nasopharynx

Case VIII: Epithelioma of the Nasopharynx: E. D., male, white, aged sixteen,
was admitted in October 1931, complaining of loss of weight, pain over the right eye,
and trismus. In May 1931, he had caught cold, and two weeks later he began to ex-
erience pain in the right ear, a right temporal headache which radiated behind the right
ear, and an impairment of hearing in the right ear. One month later trismus appeared.
All these symptoms increased in severity.

Examination showed a chronically ill patient holding his head stiffly, and unable to
flex or rotate it. Below the right angle of the jaw was a large, firm, immovable node
which measured 5 cm. in diameter. On the left side was a smaller node, 3.5 cm. in diam-
eter. The anterior cervical chains of nodes were involved bilaterally.

The right, left, and posterior areas of the neck were irradiated with high-voltage
x-rays, 860 r units to each area in divided doses. Another series was given, several
weeks later, attacking the same areas as before, 860 r units again being given over each
portal. On account of the poor general condition, the patient remained at home, too
weak to attend the clinic. Two months later he returned, and on pharyngoscopy a small,
raised, nodular mass was visible along the lateral wall of the right posterior nares. A piece removed for examination revealed a highly malignant epidermoid carcinoma, grade IV (Fig. 14). With the lesion definitely located, 2 rubber tubes, each containing 2-5 milligram tubes of radium element filtered through 1.5 mm. of platinum, were placed in each nostril for a total dose of 1200 milligram hours. The patient died the next day.

**Comment:** This is another unfortunate case where the age of the patient was the misleading factor in making the diagnosis. A malignant lesion was the last one considered in the differential diagnosis, especially since the primary lesion was not discernible.

**CASE IX: EPIDERMOID CARCINOMA OF THE NASOPHARYNX:** T. S., male, white, aged twenty, was admitted in August 1931, complaining of swollen nodes on the right side of the neck. His father had died of cancer of the neck. Six months before admission, the patient had had mumps, with bilateral involvement of the parotid glands, complicated by orchitis. The swelling on the left side of the neck receded, but that on the right persisted, and was constantly painful. It did not grow in size, but movements of the neck were greatly limited due to the pain and tenderness.

Examination revealed a node as large as an egg at the angle of the right jaw, hard, fixed, and moderately tender. The overlying skin was red. The orifice of Stenson's duct was normal. The right anterior cervical chain of nodes was enlarged, discrete, and hard.

A tentative diagnosis of tuberculous nodes was made, and the patient was treated with fractional doses of high-voltage x-rays at weekly intervals. This form of therapy produced no change. Five months after the first admission, an acute sore throat developed. A more careful examination disclosed a primary growth in the nasopharynx. At this time a node was removed from the neck for biopsy. Microscopic examination revealed transitional-cell carcinoma (Fig. 15).

With this corrected diagnosis, intensive cross-fire irradiation was instituted, 1720 r units being given to the tumor through 4 portals. The patient left the clinic to return to Ireland, and the result is not known.

**Comment:** This patient probably died, because of the extensive metastases present at the time of first admission. His youth, together
with the general benign clinical picture, diverted the minds of the observers from any consideration of cancer and caused the loss of valuable time.

**Summary**

In a group of 3,161 malignant neoplasms treated in the Radiation Therapy Department of Bellevue Hospital in the past seven years, 77 occurred in patients from one to twenty years of age. Nine of these latter neoplasms originated in the mouth or pharynx. One of these patients had two separate tumors—carcinoma of the tonsil and seminoma of the testicle.

Sarcoma occurred as a bulky tumor in the mouth. It was usually rapidly growing, and radioresistant. The hope of cure in this lesion lies in early recognition, before the volume of the mass is too great.

Epithelioma did not occur in the usual sites found in adults, which are the regions subject to chronic irritation, such as the margins of the tongue and the alveolar ridge, but was seen in the lympho-epithelialium covering the tonsil and pharyngeal lymphoid patches. It followed the tendency of growths in these locations to be highly malignant. All of our cases were of grade IV.

These cases can occasionally be cured. Of the 4 sarcomata reported in this series, one was arrested. None of the 6 epitheliomata were arrested.

The delicate skin of children prevents the employment of the large doses of external radiation with high-voltage x-rays or radium packs now in common use in adults. Consequently, greater reliance must be placed upon interstitial or topical radiation.
All persistent cervical nodes should be thoroughly investigated, and where doubt exists, should be removed for microscopic examination.

BIBLIOGRAPHY

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