

SOME CLINICAL ASPECTS OF SURGICAL MANAGEMENT OF INFRATEMPORAL FOSSA MALIGNANCIES

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Thirteen patients with infratemporal fossa malignancies treated in the Sichuan Cancer Hospital from 1988 to 1993 are reported. All cases were treated surgically with combined therapy. The survival rate of the patients with survival period beyond 2 years was 53.8%. The survival was associated with the extent of dissection ($P < 0.01$). The operation value, surgical approaches, resection range, stylohamular line and repair are analyzed and discussed. A new surgical approach, a modified stylohamular line and a new surgical concept for resection of the infratemporal fossa malignancies -- bony boundary of surgery are introduced in detail.

Key words: Infratemporal fossa malignancies, Surgery, Survival rate

There is no special report about the surgical treatment of infratemporal fossa malignancies in China. The infratemporal fossa (ITF) lies below the lateral base of the skull. The cancer of the ITF is easy to recur and the patient usually has a short survival period because of difficult exposure and high risk in operation of the ITF. Although the combined therapy is utilized to treat the malignancies, the surgical resection is the key that decides the prognosis.¹ 13 cases treated with combined therapy from 1988 to 1993 in our hospital are reported, and some important aspects of the surgical management of the cancers are discussed especially.

CLINICAL MATERIALS, METHODS AND RESULTS

General Condition

Male patients were 9, and female 4, aged from 5 to 68 years old. The diagnosis of the ITF cancers was confirmed by CT or MRI, surgery and histology. 3 cases were diagnosed the primary cancer of the ITF, 10 cases the secondary cancer. For the primary cases, the cancer classification is referred to the classification of oral cancer because of the classification for the primary cancer in absence.² For the secondary cases, the classification is referred to UICC. 4 cases were T₃No-N₃M₀, and 9 T₄No-N₂M₀. All cases were treated surgically combined with pre-operative or/and post-operative radiotherapy with or without chemotherapy.

Tumor Type, Invaded Region, Surgical Management and Results of Follow-up

That is appeared in Table 1.

DISCUSSION

Applied Anatomy³ and Surgical Value

The ITF lies below the lateral base of the skull. The roof of the ITF is formed by the infratemporal surface of the greater wing of the sphenoid, the anterior boundary by the postero-lateral wall of the maxilla, the medial boundary by the lateral pterygoid

plate, tensor palati muscle, superior constrictor and the pterygomaxillary fissure, the lateral side by the coronoid process, zygomatic arch, ascending ramus of the mandible, masseter and temporalis muscles, and the floor by the superior gingivo-buccal sulcus. Behind the ITF is the parapharyngeal space (PPS). The ITF communicates the orbit, the zygomatic-temporal region, the nasopharynx, the nasal cavity, the oral pharynx and the anterior faucal region through the inferior orbital fissure, the temporal fossa, the pterygopalatine fossa and the superior gingivo-buccal sulcus, respectively. Familiarizing with the main points of the ITF anatomy above is the premise of surgeon's resecting the ITF cancers safely and completely.

With CT and MRI spreading in recent decade, the diagnosis and treatment of the ITF cancers are drawing the attention of surgeons of head and neck surgery more and more. And in the meanwhile, a big progress has been made in treatment of the ITF malignancies, with the 2-year survival rate springed beyond more than 50% from the previous 5%.^{1,4-6} In our group, according to Kaplan-Meire method, the 2-year survival rate reached 53.8% (Table 1). And the resection degree was related to the 2-year survival ($P<0.01$)(Table 2).

Surgical Approaches

There are at least seven different surgical approaches into the ITF, and each approach has its own trait.³ We designed a new surgical approach, which we called modified lateral approach. In this approach, an incision is made to split the lower lip in midline, then curved and extended laterally at two finger's breadths below The mandible, and ended at the mastoid process. The skin incision is depended by incising the platysma and cervical fascia. The upper flap is reflected upward, and away from the lower border of the mandible whilst trying to preserve the mandibular branch of the facial nerve. The outer aspect of the body of the mandible is exposed by dividing the attachment of the masseter muscle to the angle of the mandible. The periosteum of the lower border of the mandible is exposed and divided along the axis of the bone. The horizontal and ascending rami of the mandible are widely exposed by using a periosteal elevator, and the inferior gingivo-buccal sulcus identified and divided backwards and upwards

to the maxillary tuber. Now the facial tissues flap, which contained the parotid gland, the facial nerves and the masseter muscle, is pushed upwards furthermore until the coronoid process and the mandibular incisure is exposed completely. By dividing the attachment of the temporal muscle to the coronoid process and the ascending ramus of the mandible, and retracting the ascending ramus laterally, an adequate access to the ITF is gained. At the conclusion of the operative exposure, the medial one along the upper gingivo-buccal meeting with the Ferguson-Weber incision, and the lateral one curved below the aricular lobule and gone upwards in front of the tragus. Every case used this approach in our group was gained adequate exposure of the ITF (Table 1).

For the superior approach, the inferior approach, the lateral approach and the modified Ferguson-Weber incision approach, we have described their operative procedures and indications in detail.³ The superior and inferior approaches, with their limited operative exposure, only can be served as biopsy approaches of the ITF malignancies; The lateral approach needs to free the facial nerve branches and resect the parotid and the zygomatic arch, and because the facial nerve branches just cover the lateral inlet of the ITF, the cancer exposure and resective operation are limited. The modified Ferguson-Weber incision approach is obviously different from our modified lateral approach. But when the modified lateral approach can not give a good exposure of the ITF tumor, this approach incision can connect with Ferguson-Weber incision through dividing the superior gingivo-buccal salcus, and thus a very good exposure of the ITF tumor can be achieved. By combining the two approaches, we successfully resected a fibroma that extensively invaded the ITF (this benign case is not included in our group of this report).

Referring to the other authors' surgical experiences³ and our experiences of the ITF approaches, we suggest: 1) for some primary or secondary ITF cancers, which locate near the lateral border of the ITF, such as the parotid cancer, buccal cancer and the cancer of the ascending ramus of the mandible, the modified lateral approach should be considered as the first choice; 2) for primary or recurrent nasopharyngeal malignancies which lie near the medial side of the ITF, the modified lateral approach plus the Ferguson-Weber incision approach should be first considered; 3) for some secondary ITF cancers originated from the maxillary sinus, orbit

region, oral pharynx and soft palate, the anterior transantral approach should be chosen first; 4) for the cases secondary to the external acoustic meatus or

middle ear, the extended anterior-lateral approach or C type approach should be used.

Table 1. The tumor type, invaded range, surgery and follow-up results of the 13 cases

Case No.	Tumor type	Invaded region	Surgical approach	Exposed degree**	Resection range***	I stage repair	Follow-up result
1	Primary, carcinogenesis of cyst	ITF+PPS'	modified lateral	A	+++ (the ramus of the mandible and zygomatic arch resected)	sternomastoid and masseter muscles flap	5 years, survival
2	Primary heman-giosarcoma	ITF+temp oral fossa	superior	C	+, (partial tumor resected)	directly closed	3months, recurrence and death
3	Primary, fibrosarcoma	ITF+PPS	modified lateral	A	++, (the lateral pterygoid plate which should be resected left)+neck dissection	RTIMF***	6months, recurrence and death
4	Secondary, poorly-differentiated carcinoma of parotid	ITF+PPS	modified lateral	A	+++ (the ramus of the mandibl resected) + neck dissection	sternomastoid and masseter muscles flap	3 years, survival
5	secondary, recurrent cancer of parotid	ITF+PPS	lateral	B	+, (partial tumor resected) +neck dissection	pectoralis major myocutaneous flap (complete necrosis)	8months, recurrence and death
6	secondary, carcinogenesis of the mixed	ITF+PPS	modified lateral	A	+++ (the ramus of the mandible resected) + neck dissection	pectoralis major myocutaneous flap(delayed healing for one year)	2 year, survival
7	secondary, chondro-sarcoma of the mandible	ITF+PPS	inferior	C	+, (partial tumor resected)	directly closed	2 months, lost follow-up
8	secondary, recurrent basal cell carcinoma of orbit	ITF+ maxillary sinus	antero-lateral	B	+++ (orbital contents, the superior and lateral-posterior walls of the mailla +zygomatic arch resected) + neck dissection	RTIMF	2.5 years, survival
9	secondary, leiomyosarcoma of the mandible	ITF+ PPS	modified lateral	A	++,+ neck dissection	RTIMF (1/4 flap necrosis)	1 year, metastasis and death
10	secondary, carcinogenes of papillomas of maxillary sinus	ITF	modified Ferguson-Waber incision	A	++, (the lateral pterygoid plate unresected)	split-thickness graft	4 months, recurrence and death
11	secondary, clear	ITF+PPS	extended	A	+++ (the lateral	RTIMF	2.5 years, survival

	cell carcinoma of maxillary sinus	+nasopharynx +oral pharynx	anterior-lateral		pterygoid plate and the ramus of the meadible resected) +neck dissection		lost follow-up
12	secondary, squamous carcinoma of maxillary sinus	ITF	modified Ferguson-Weber incision	A	++, (the lateral pterygoid plate resected) +neck dissection	split-thickness graft	3 months, lost follow-up
13	secondary, squamous carcinoma of maxillary sinus	ITF	modified Ferguson-Weber incision	A	++, (the lateral pterygoid plate resected) +neck dissection	split-thickness graft	1 year, lost follow-up

* PPS-parapharyngeal space. ** Under direct vision field, more than 90% of the tumor body exposed is A; less than 50% is C; between the A and C is B. *** The bony boundaries which should be resected and the tumor body completely resected is +++, only the tumor body resected completely is ++; the rest is +. **** RTIMF-Rhombotrapzious island myocutaneous flap.

Table 2. The relation between the resection range and more than 2-year survival of the ITF cancers of 10 cases

Follow-up result	Resection range	
	+++	+ - ++
Survival	5	0
Recurrence and death	0	5

The cases lost follow-up within 2 years do not be accepted in the Table. According to Fisher exact method, $P < 0.01$

Resection Range

The ITF has six boundaries, and four boundaries are bony that are the infratemporal surface of the great wing of the sphenoid, the postero-lateral wall of the maxilla, the lateral pterygoid plate, the ascending ramus of the mandible and the zygomatic arch. The bony boundaries constitute the safe borders of the resection of the ITF cancer. The bony boundary should be resected if CT or MRI shows the bony side has been invaded, and beside which, when the ITF cancer touches or adjoins one bony boundary, the bony boundary should also be considered to resect in order to ensure an en bloc resection of the ITF cancer. For example, the lateral pterygomaxillary plate should be resected in the cases with the advanced cancer of the maxilla or recurrent nasopharyngeal carcinoma which adjoins and easily invades the plate, although CT or MRI shows no trace of the plate being invaded by the cancer. Reserving the plate in this condition means a rather high risk of the cancer recurrence

(Table 1).

The posterior wall of the ITF lies in front of the PPS. Judging whether the PPS is invaded or not, we can apply the stylohamular line which is an imaginary line that connects the styloid process and the pterygoid hamulus.¹ The stylohamular dissection does take advantage of the line that the carotid sheath does not lie beyond the line medially, and so gives an en bloc resection of the ITF tumor safely.^{1,7} Through reviewing the papers of the anatomy of the ITF and the PPS,^{3,8} and measuring the cross-section sample of the ITF and the PPS repeatedly, we found that a modified stylohamular line that connects the posterior ridge of the medial pterygoid plate and the styloid process can also be served as a border between the ITF and the PPS (Figure 1). By means of the modified stylohamular line, we can clearly know if the PPS is invaded through CT or MRI. In our group, 8 cases have both of the ITF and the PPS being invaded by the cancers, and the cancers of the PPS can not be resected only with the stylohamular dissection. For these cases, we traced the internal carotid artery upwards to the skull base and resected the cancer in the PPS in front of the internal carotid artery. According to the descriptions above, we got a new concept that is bony boundaries of the ITF for surgery, in which, the boundaries are constituted by the lateral pterygoid plate, the postero-lateral wall of the maxilla, the ascending ramus of the mandible, the zygomatic arch and the modified stylohamular line. The concept can guide the design of the ITF operation plan and a safe, entire resection of the ITF cancer.

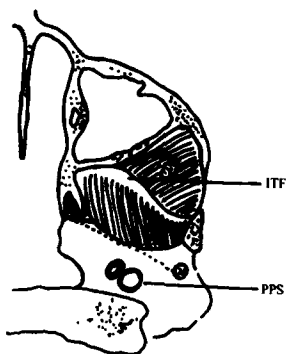


Fig 1. The dotted line that connects the posterior ridge of the medial pterygoid plate and the styloid process is the modified stylohamular line

I Stage Repair

The defect left by the resection of the ITF cancers often needs to repair, with a main purpose of being protection of the bare internal carotid artery. The myocutaneous flap with vascularized pedicle is the first choice of the repair of the defect in I stage. If the extent of the defect is not very big, the sternomastoid myocutaneous flap can be applied for the repair. When the defect is conspicuous, the rhombotrapezious island myocutaneous flap (RTIMF) can be used to reconstruct it. 4 patients were repaired with the RTIMF, 3 cases being a complete survival of the RTIMF and one 1/4 partial necrosis of the flap. The major advantage of the RTIMF is that it provides a long paddle of hairless skin and muscle that can be rotated as far as the lateral skull base in a single stage.⁹

The length and the muscle volume of the pectoralis major myocutaneous flap are limited for repairing the ITF big defect, so the results of the I stage repair are disappointed in our group (Table 1).

REFERENCES

1. Rosenblum BN, Katsantonis GP. Infratemporal fossa and lateral skull base dissection: long-term results. *Otolaryngology. Head & Neck Surgery* 1990; 102:106.
2. 廖海星, 李彬, 陶远孝, 等。颞下窝恶性肿瘤。 *中国肿瘤临床* 1994; 21(增刊): 1.
3. 廖海星。颞下窝肿瘤(综述)。 *国外医学·耳鼻咽喉科分册* 1993; 17: 152.
4. Fenez JJ, alksen FJ, Lawrence W. Craniofacial resection for tumors invading the pterygoid fossa. *Am J surg* 1969; 118: 732.
5. Frazell EL, Lewis JS. Cancer of the nasal cavity and paranasal sinus. *Cancer* 1963; 16: 1293.
6. Sission GD, Johnson NE, Ameri CS. Cancer of the maxillary sinus: clinical classification and management. *Ann Otol Rhinolaryngo* 1963; 72: 1050.
7. Friedman WH, Katsantonis GP, Cooper MH. Stylohamular dissection: a new method for en bloc resection of malignancies of the infratemporal fossa. *Laryngoscope* 1981; 91: 1869.
8. Garrau RL, Myers EN, Johnson JT. Management of tumors arising in parapharyngeal space. *Laryngoscope* 1990; 100: 583
9. 廖海星, 陶远孝。新型斜方肌下部岛状肌皮瓣对高位颅颌面肿瘤切除后缺损修复的研究。 *中国肿瘤* 1994; 3: 26.