

Treatment outcomes of juvenile
nasopharyngeal angiofibroma
according to stage and surgical
approach

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Treatment outcomes of juvenile nasopharyngeal angiofibroma according to stage and surgical approach

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<TABLE OF CONTENTS>

ABSTRACT.....	1
I. INTRODUCTION.....	3
II. SUBJECTS AND METHODS.....	5
III. RESULTS.....	7
1. Preoperative assessment.....	7
2. Recurrences or remnant tumor according to stage and surgical approach.....	7
3. Analysis of the salvage operations.....	10
4. Postoperative complications requiring intervention.....	11
5. Recurrence rates after an endoscopic surgical approach.....	12
IV. DISCUSSION.....	13
V. CONCLUSION.....	18
REFERENCES.....	20
ABSTRACT(IN KOREAN).....	23

LIST OF TABLES

Table 1. Radkowski staging system for juvenile nasopharygeal angiofibroma.....	6
Table 2. Staging of the 20 cases reviewed in this study.....	6
Table 3. Recurrences according to staging and surgical approach	9
Table 4. Surgical approach and recurrence rate.....	10
Table 5. Analysis of salvage operations.....	11
Table 6. Postoperative complications requiring intervention...	12
Table 7. Recurrence rate after endoscopic surgery, including salvage surgery.....	13

<ABSTRACT>

Treatment outcomes of juvenile nasopharyngeal angiofibroma according to stage and surgical approach

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Juvenile nasopharyngeal angiofibroma (JNA) is a benign tumor of the nasopharynx, and for its treatment, many surgical approaches have been suggested. However, selecting the appropriate one for the tumor in an advanced stage is still controversial. This is a retrospective study that aimed to assess the treatment outcomes according to stage and surgical approach in juvenile nasopharyngeal angiofibroma (JNA). A retrospective review of JNA patients treated at our institution resulted in the identification of 20 patients with JNA with a Radkowski stage greater than I and a minimum follow-up of 10 months. All 20 JNA patients were male and the median age at diagnosis was 15.5 years. Using Radkowski staging, six patients were in stage IIa, three patients were in stage IIb, eight patients were in stage IIc, two patients were in stage IIIa, and one patient was in stage IIIb. Seven of 20 patients were treated surgically for recurrence or a remnant tumor after the initial operation and the mean interval to recurrence was 15.5 months. Recurrence or remnant tumors were most commonly observed in patients

with stage IIc tumors (50.0%) compared to other stages (33.3%, 33.3% and 0% for stages IIa, IIb, and IIIa/IIIb, respectively). An endoscopic approach was chosen in four patients, with a recurrence rate of 25.0% but the tumors of stage IIa and IIb were completely controlled by endoscopic surgery. A midfacial degloving approach (MFDA) was used in seven patients, with a recurrence rate of 42.9%. The maxillary swing approach was taken in three patients, with complete control. Postoperative complications that required intervention occurred in 14.8% of cases, especially when the maxillary swing or infratemporal fossa approaches were used. Therefore, the modality of a surgical treatment of JNA should be selected based on the ability to achieve complete resection of tumor and possible complications. In conclusion, whether an minimally invasive approach including endoscopic approach and MFDA or a relatively invasive approach including maxillary swing and infratemporal fossa approach should be used for Stage IIc is equivocal. However, considering possible postoperative complications, we recommend using an endoscopic approach or midfacial degloving approach for stage IIc initially. Furthermore, recurrent stage IIc or stage III should be managed by a maxillary swing or infratemporal fossa approach despite the postoperative complications associated with these approaches.

Keywords : JNA, treatment outcome, postoperative complication, Stage IIc

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I. INTRODUCTION

Juvenile nasopharyngeal angiofibroma (JNA) is a rare benign neoplasm that accounts for 0.05% of all tumors of the head and neck.¹ JNA is a histologically benign but highly vascular and locally invasive tumor that occurs primarily in male adolescents, with an average age of onset of 15 years.²⁻³ This tumor originates from the posterolateral wall of the nasal cavity in close proximity to the superior aspect of the sphenopalatine foramen. It may extend from the nasal cavity to the nasopharynx, the paranasal sinuses, the orbit, and the pterygopalatine fossa, and may even invade the skull base or extend intracranially.⁴ Approximately 20% of patients have evidence of skull base invasion at the time of diagnosis.⁵

Typically, patients present with unilateral nasal obstruction and recurrent epistaxis. As the disease advances, facial deformities, proptosis, blindness, and

cranial nerve palsies may occur. There are a number of therapeutic options, but surgical excision preceded by embolization remains the primary treatment modality.⁶⁻⁷ The various surgical approaches that have been used to treat this condition range from a transpalatal approach to a lateral rhinotomy to midfacial degloving approach,⁸ while for some patients, a maxillary swing or infratemporal fossa approach is also required. However, resection of JNA is classically considered to be high-risk surgery with respect to hemorrhage, and may require blood transfusion. In addition, perioperative bleeding can significantly hinder excision. Consequently, most experts agree that preoperative embolization should be performed.⁹

Furthermore, postoperative complications including cosmetic deformities, facial scars, facial asymmetry, and psychiatric trauma should also be taken into consideration. Considering that most JNA patients are adolescents and are still growing, these complications could be critical not only physically, but also emotionally. In recent years, endoscopic surgery has been used for resection of JNA.¹¹ Endoscopic approaches may become the treatment of choice due to the advantages of endoscopic surgery in general that include minimal bleeding, an operation of shorter duration, greater efficacy, and potentially less postoperative complications, especially for tumors for which conventional surgery is limited by the tumor size and or location. However, in a previous report of patients who were operated on using an endoscopic approach, most of the patients had limited tumors of Radkowski stage IIa at most.¹²

The purpose of this study was to evaluate the treatment outcomes of 20 JNA patients according to Radkowski stage and surgical approach.

II. SUBJECTS AND METHODS

The medical records of patients with histologically-proven juvenile angiofibroma who received treatment at our institution between 1991 and 2008 were reviewed retrospectively. Total thirty five patients were diagnosed with JNA, but fifteen patients were excluded due to insufficient data. Therefore, twenty patients were enrolled in our study. All patients were male, and they ranged in age from nine to 51 years (mean 18.2 years, median 15.5 years). The minimum follow-up period was 10 months. All patients had undergone surgical treatment in our department and received a preoperative assessment by means of a computed tomography (CT) scan or magnetic resonance imaging (MRI) and angiogram with embolization. Radkowski's staging system for JNA was used for classification in this study (Table 1). Of the 20 patients, six patients (30.0%) had Radkowski stage II disease; three patients (15.0%) had stage IIb disease; eight patients (40.0%) had stage IIc disease; two patients (10.0%) had stage IIIa disease; and one patient (5.0%) had stage IIIc disease (Table 2).

Patients with less than 10 months of follow-up or with stage I JNA according to Radkowski's staging system were excluded. Patients who were thought to have stage I JNA had incomplete preoperative assessment data, for

example the absence of preoperative MRI scans or angiograms, or inadequate operation records, therefore fifteen patients with stage I were excluded from this study. At our institution, JNA has been treated using several different surgical approaches, including an endoscopic approach, transoral or transpalatal approach, lateral rhinotomy, midfacial degloving approach, maxillary swing approach, infratemporal fossa approach, and a craniofacial approach.

Table 1. Radkowski staging system for juvenile nasopharyngeal angiofibroma.

Ia	Limited to nose and/or nasopharyngeal vault
Ib	Extension into ≥ 1 sinus
IIa	Minimal extension into PMF
IIb	Full occupation of PMF with or without erosion of orbital bones
IIc	Or posterior to pterygoid plates
IIIa	Erosion of skull base – minimal intracranial extension
IIIb	Erosion of skull base – extensive intracranial extension with or without cavernous sinus invasion

PMF = pterygomaxillary fossa

Table 2. Staging of the 20 cases reviewed in this study.

Stage	No. of cases (%)
IIa	6 (30.0)
IIb	3 (15.0)
IIc	8 (40.0)
IIIa	2 (10.0)
IIIb	1 (5.0)
Total	20 (100)

III. RESULTS

1. Preoperative assessment

Patients received a preoperative assessment via a computed tomography (CT) scan or magnetic resonance imaging (MRI) and angiogram with embolization, and were then staged according to Radkowski's staging system. A CT scan was performed for all patients and MRI was performed for 19 patients (95.0%). Preoperative angiography with embolization was performed in 17 of the 20 patients (85.0%) before surgery. Superselection of the supplying external carotid artery and serial embolization were performed at the same time.

2. Recurrences or remnant tumor according to stage and surgical approach.

The overall recurrence or remnant rate was 35.0% (7/20) after the initial operation. Recurrence was detected in two of six cases with stage IIa JNA (33.3%, 2/6). A recurrence rate of 33.3% (1/3) was noted in stage IIb cases and a recurrence rate of 50.0% (4/8) was noted in stage IIc cases, including one patient in whom the tumor was incompletely resected at the initial operation. However, two patients with stage IIIa and one patient with stage IIIb were completely controlled without recurrence by initial surgery. Stage IIc JNA had a higher risk of recurrence or remnant tumor than the other stages. All 20 patients underwent surgical resection. Four patients (20.0%) were operated on using an endoscopic approach, two patients (10.0%) were operated on using a transoral or transpalatal

approach, two patients (10.0%) were operated on using a lateral rhinotomy approach, seven patients (35.0%) a midfacial degloving approach, three patients (15.0%) a maxillary swing approach, and one patient each (5.0%) an infratemporal fossa approach or a craniofacial resection approach. Among the four patients operated on using an endoscopic approach, recurrence was observed in one patient (25.0%) with stage IIc JNA. Of the two patients operated on using a transoral or transpalatal approach, one with a stage IIb tumor had recurrence while the other patient with a stage IIc tumor had a remnant tumor after the initial surgery due to underestimation of the tumor extent. One of two patients (50.0%) with stage IIa JNA who was operated on using a lateral rhinotomy approach experienced JNA recurrence after surgical treatment (Table 3).

Seven patients underwent surgical resection of JNA via the MFDA and recurrence was observed in three patients (42.9%), among whom one patient had stage IIa JNA while the other two patients had stage IIc JNA. Two patients with stage IIc and one patient with stage IIIa JNA underwent surgical resection via the maxillary swing approach; JNA was completely controlled after this operation in these patients. An infratemporal fossa approach was performed only on one patient with stage IIIa JNA and a craniofacial resection approach was used only for one patient with stage IIIb disease. Both tumors were completely resected at the first operation without recurrence (Table 4).

Table 3. Recurrences according to staging and surgical approach.

Staging (n)	Surgical approach (n)	No. of recurrence	Total No. of recurrence (%)
	Endoscopic surgery (3)	0	
Stage IIa (6)	Lateral rhinotomy (2)	1	2/6 (33.3)
	MFDA (1)	1	
Stage IIb (3)	Transpalatal approach (1)	1	1/3 (33.3)
	MFDA (2)	0	
Stage IIc (8)	Endoscopic surgery (1)	1	4/8 (50.0)
	Transoral approach (1)	1 *	
	MFDA (4)	2	
	Maxillary swing (2)	0	
Stage IIIa (2)	Maxillary swing (1)	0	0/2 (0)
	ITFA (1)	0	
Stage IIIb (1)	Craniofacial approach (1)	0	0/1 (0)
Total	Surgical approach (20)	7	7/20 (35.0)

MFDA= Midfacial degloving approach, ITFA= Infratemporal fossa approach

* Remnant case

Table 4. Surgical approach and recurrence rate.

Surgical approach (n)	Staging (n)	No. of recurrence (%)
Endoscopic surgery (4)	IIa (3), IIc (1)	1/4 (25.0) *
Transoral or palatal (2)	IIb (1), IIc (1) †	2/2 (100.0)
Lateral rhinotomy (2)	IIa (2)	1/2 (50.0)
MFDA (7)	IIa (1), IIb (2), IIc (4)	3/7 (42.9) ‡
Maxillary swing (3)	IIc (2), IIIa (1)	0/3 (0)
ITFA (1)	IIIa (1)	0/1 (0)
Craniofacial resection (1)	IIIb (1)	0/1 (0)

MFDA= Midfacial degloving approach

* Staging IIc, † Remnant case, ‡ Staging IIa, IIc

3. Analysis of the salvage operations

In our study, seven patients (35.0%) required a salvage operation for recurrent JNA (6/7 patients) or a remnant tumor (1/7 patients) after the initial operation after an interval of 6 to 30 months (median 15.6 months). Using Radkowski's staging system, four patients had the same JNA stage initially and after the recurrence; however, the other three patients had higher recurrent stages than the initial stage. Three of seven cases were treated via endoscopic surgery, two patients were operated on using a midfacial degloving approach, and two patients were operated on using the maxillary swing approach. All seven patients that had a salvage operation were treated without recurrence (Table 5).

Table 5. Analysis of salvage operations.

Case	Time to recurrence interval (months)	Re- stage (Initial stage)	Initial surgical approach	Revision surgical approach
1	18	IIb (IIb)	Transpalatal approach	Endoscopic surgery
2	10	IIIa (IIc)	Endoscopic surgery	MFDA
3	Remnant	IIc (IIc)	Peroral approach	Maxillary swing
4	22	IIIa (IIc)	MFDA	Maxillary swing
5	6	IIb (IIa)	MFDA	Rev. MFDA
6	7	IIc (IIc)	MFDA	Endoscopic surgery
7	30	IIa (IIa)	Lateral rhinotomy	Endoscopic surgery

MFDA= Midfacial degloving approach

4. Postoperative complications requiring intervention

Postoperative complications that required intervention were observed in four of the 27 total cases (14.8%), including the seven salvage operations. Postoperative complications were as follows: external scars, palatal dehiscence, an asymmetric face, or wound infections. Facial scars and palatal dehiscence were observed when the maxillary swing approach was used, and were treated by scar revision and a rotational flap, respectively. An asymmetric face was observed in a patient in whom an infratemporal fossa approach had been used, and was treated by zygomatic reconstruction. Wound infection was observed after a craniofacial resection was performed, and was treated using a free flap reconstruction. In summary, postoperative complications that required intervention were noted mainly after maxillary swing or neurosurgical approaches (Table 6).

Table 6. Postoperative complications requiring intervention.

Surgical approach	Postoperative complication	No. of cases
Maxillary swing	External scar	1
	Palatal dehiscence	1
ITFA Type C	Asymmetric face	1
Craniofacial resection	Wound infection	1

ITFA = infratemporal fossa approach

5. Recurrence rates after an endoscopic surgical approach

Seven patients, including three salvage cases, were treated by endoscopic surgery and among these patients, four were classified with stage IIa tumors, one with a stage IIb tumor, and two with stage IIc tumors. In this study, stage IIa and IIb tumors were completely resected using an endoscopic approach without any recurrence; however, one patient with two JNAs at stage IIc experienced recurrence after endoscopic surgery and a midfacial degloving approach was used in the salvage operation. Therefore, the overall recurrence rate was 14.3% (1/7) after total endoscopic surgery when the three salvage operations were taken into account (Table 7). The overall recurrence rate was 33.3% (3/9) for the total midfacial degloving approach, including two salvage operations, while no recurrence was noted when the maxillary swing approach was used, including two salvage operations.

Table 7. Recurrence rate after endoscopic surgery, including salvage surgery.

Stage	No. of cases	No. of recurrence (%)
IIa	4	0/4 (0)
IIb	1	0/1 (0)
IIc	2	1/2 (50.0)
Total	7	1/7 (14.3)

Primary endoscopic surgery : four cases

Salvage endoscopic surgery : three cases

IV. DISCUSSION

Juvenile nasopharyngeal angiofibroma develops predominantly in adolescent males, with an average age of presentation of 17 years. Typical presenting symptoms include spontaneous recurrent epistaxis, nasal obstruction, and nasal discharge, and other clinical symptoms depend on the extent of the tumor.^{13, 14} In this study, all 20 patients were male with a mean age of 18.15 years, and most of the patients presented with frequent epistaxis and nasal obstruction.

The diagnosis of JNA is based on careful medical history-taking and nasal endoscopic examination, and is supplemented by imaging studies using computed tomography or magnetic resonance imaging. With advancements in angiography, definite diagnosis and embolization of the tumor-feeding vessels can be performed at the same time. CT scans (100%), as well as MRI (95%) and angiograms with embolization (85%) were used in our study.

The use of radiation therapy to treat JNA is controversial due to potential

long-term morbidity. However, in advanced and recurrent cases, radiation therapy offers a highly effective and efficient option for management and treatment of the disease.¹⁵ Although a number of therapeutic options are available to treat JNA, surgery remains the primary treatment modality. A number of surgical approaches have been developed, and the selection of the approach depends on the site of origin, the extent of the tumor, and the surgeon's preference. The most important principle in surgery is to be able to expose the tumor for complete and safe removal without perioperative and postoperative complications. In this study, all 20 JNAs were surgically resected using one of a number of different surgical approaches ranging from endoscopic, transoral, transpalatal, midfacial degloving, to maxillary swing approaches, while neurosurgical approaches were also required for some patients. Traditionally, the transoral or transpalatal approach has been the approach most frequently used and is effective for tumors limited to the nasal cavity or nasopharynx. Lateral rhinotomy was used in lieu of the transpalatal approach in JNAs that extended laterally into the sphenopalatine foramen. However, the main disadvantage of the transpalatal approach is the risk of developing a palatal fistula, and lateral rhinotomy also has an inherent disadvantage, namely a visible facial scar.¹⁶ The midfacial degloving approach was later adopted as a scarless alternative to lateral rhinotomy. This technique provides excellent surgical exposure while avoiding facial scarring.¹⁷ Furthermore, after the introduction of an endoscopic approach in the early 1990s, the use of endoscopic surgery for the resection of JNA has been reported.^{18,19} Roger et al.³ reported their

findings for 20 JNA patients in whom endoscopic resection only was performed. In their series, complete resection was achieved in 18 of 20 patients (90%) with JNA stages ranging from Ia to IIIa according to Radkowski's staging system; the remaining two patients had small asymptomatic tumor remnants after surgery. Although endoscopic surgery is becoming popular because of its efficacy and safety, it still has inherent limitations in cases that extend laterally. In fact, there are only a few reports in the literature reporting the treatment of advanced JNA with infratemporal fossa extension exclusively via endoscopy.^{3,20} At our institution, we stopped using the transpalatal and lateral rhinotomy approaches for the treatment of JNA in 1999, and instead, use endoscopic or midfacial degloving approaches to resect stage IIa, IIb, and a certain portion of IIc tumors. However, one stage IIc tumor was misdiagnosed and therefore undertreated, and the patient underwent tumor resection via a transoral approach in 2004, leaving a remnant tumor at the initial surgery. It is noticeable that no major complications requiring intervention occurred for these two approaches (endoscopic and midfacial degloving approaches), either at the time of the primary operation or during the salvage operation. Although only minimal complications were reported, our results show that the recurrence rate, including salvage operations, was 14.3% for the endoscopic approach and 33.3% for the midfacial degloving approach. In contrast, a portion of stage IIc and all of stage III JNA tumors were resected using relatively aggressive approaches such as the maxillary swing, infratemporal fossa, or craniofacial approaches, and as a result, we achieved complete removal of the

tumor without any recurrence, even though cosmetic facial problems or wound infection requiring intervention were observed. Although advanced JNA stages (stage IIc, III) can be completely removed and controlled by maxillary swing and other neurosurgical approaches, the possible postoperative complications are very severe considering that the majority of juvenile nasopharyngeal angiofibroma patients are adolescent and the growth of the male craniofacial skeleton continues until 20 years of age at least, with approximately 40% of maxillary growth occurring after the age of 12 years.¹⁰ Therefore, the surgical treatment modality used to resect JNA should be selected based on the ability to achieve complete resection of the tumor as well as possible complications.

Recurrence is a prominent feature of the natural history of JNA. Recurrence rates as high as 30%–50% have been reported by McCombe et al.^{21,22}, while Gullane et al.²³ reported a 36% recurrence rate after the first operation. In our study, seven of 20 patients (35.0%) had recurrent or remnant tumors after the first operation. These results are better than those reported by McCombe et al.^{21,22} and Gullane et al.²³ considering that we excluded all stage I cases (15 cases) from our study due to poor data quality. The goal of our study was to analyze the recurrence rate of JNA according to the initial surgical approach used and the stage of the tumor. A recurrence rate of 25% and 42.9% was observed for endoscopic approaches and MFDA, respectively. The recurrence rate including salvage surgery cases was 14.3% and 33.3% for endoscopic approaches and MFDA, respectively. The maxillary swing approach was found to be able to

control the tumor completely in terms of no recurrence. However, the above results cannot be compared directly, because different surgeons performed different operations.

We found that the most common stage in which recurrence developed was not stage III, but rather stage IIc. This result may be due to the fact that stage IIc is an equivocal stage in which both relatively minimally invasive approaches including endoscopic and midfacial degloving surgery and aggressive approaches including maxillary swing surgery or neurosurgical approaches can be used. In contrast to stage IIc, we did not hesitate to use aggressive surgical approaches for the treatment of JNA involving the CNS i.e. stage III JNA. Therefore, when selecting a surgical approach to treat stage IIc tumors, the patients should be made aware of the risk of possible recurrence if a minimally invasive approach is used. Because this tumor type has the tendency to regress as the patient ages, selection of a surgical approach with minimal complications may be preferable.

A total of seven patients (stage IIa : 4pts, stage IIb : 1pt, stage IIc : 2pts) underwent endoscopic resection during the initial operation or salvage surgery. Complete removal of the tumor without recurrence was possible in all cases except for one patient with a stage IIc tumor. There were also no noticeable complications. Therefore, the endoscopic approach should be considered the primary treatment of choice to treat stage IIa and IIb tumors. However, the maxillary swing approach and other neurosurgical approaches should be considered for stage IIc tumors if complete removal and avoidance of recurrence are the major treatment outcomes.

However, as we stated earlier, these invasive approaches can result in the development of major complications. Therefore, we propose the following. Initially, an endoscopic approach or MDFA should be considered for stage IIc tumors if the patient accepts the possibility that they may require an additional operation that is likely to be more aggressive than the first operation. Second, relatively aggressive approaches including the maxillary swing approach should be implemented for recurrent tumors in patients with an initial tumor grade of stage IIc or III despite the possibility of complications.

Finally, on retrospective analysis of the CT scans of patients with recurrent disease at the time of first diagnosis, basal wall invasion of the sphenoid sinus and expansion into the sphenoid sinus were observed in most cases. Lloyd et al.²⁴ reported that 93% of recurrences occurred in cases with deep invasion and expansion into the sphenoid sinus. Howard et al.²⁵ also found that 93% of recurrences occurred in patients with imaging evidence of invasion of the sphenoid diploe through a widened pterygoid canal. These reports suggest that drilling-out of the cancellous bone of the sphenoid bone and pterygoid palate is essential to decrease the rate of recurrence. Prospective studies are required to evaluate this hypothesis.

V. CONCLUSION

We analyzed the efficacy of various surgical approaches and treatment

outcomes according to tumor stage in this study. The Radkowski staging system was used, and we found that an endoscopic approach was sufficient to manage tumors of Stage IIa and IIb safely and efficiently. Stage III tumors were completely controlled using aggressive approaches including maxillary swing and neurosurgical approaches, but there was a risk of developing postoperative complications that required intervention. The recurrence rate was the highest for Stage IIc tumors compared to the other stages, and various surgical approaches were used to treat Stage IIc tumors. Finally, we recommend that a minimally invasive approach, namely an endoscopic approach or MDFA, should initially be used to treat stage IIc tumors. However, for stage III tumors or recurrent stage IIc tumors, complete resection of the tumor should be the primary consideration.

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ABSTRACT (IN KOREAN)

비인강 혈관섬유종에서 병기 및 수술 방법에 따른 치료 결과

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비인강 혈관섬유종은 두경부 영역에서 발생하는 양성 종양으로 청소년기 남성에 특히 많이 발생한다. 치료에 있어서 수술적 제거가 근간이 되고 있으나 진행된 병변에 대해서 어떤 수술적 접근법을 택할 것인가는 아직까지 의견이 분분하다. 본 연구에서는 술 전 병기 및 다양한 수술적 접근법에 따른 비인강 혈관섬유종의 치료 결과에 대해서 보고하고자 한다. 본원에서 비인강 혈관섬유종으로 수술적 치료를 받은 총 35명의 환자중에서 의무기록 조사가 완전한 환자 20명을 후향적으로 비교 분석 하였다. 대상군은 모두 남자 였으며 평균 연령은 15.5세(9-51세) 이었고 최소 추적 관찰 기간은 10개월(10-96개월) 이었다. 병기 결정은 Radkowski staging system을 사용하였고 본 연구에서는 stage I 대상군 15명은 불명확한 의무기록을 이유로 제외하였다. Stage IIa인 환자는 6명, stage IIb인 환자는 3명, stage IIc인 환자는 8명, stage IIIa인 환자는 2명 이었고 stage IIIc인 환자는 1명 이었다. 이 중 처음 수술 후 재발되거나 잔여 종양이 발생된 경우는 7명 이었고 이 중 잔여 종양이 발생된 환자는 1명 이었다. 따라서 처음 수술 후 전체 재발률은 35%(7/20)이었고 수술 시점에서 재발

시점까지의 평균 기간은 15.5개월 이었다. 재발 혹은 잔여 종양 발생률을 병기 및 수술 접근법에 따라서 비교 분석 하였고 그 결과는 다음과 같다. 병기에 따른 재발률에 있어서는 stage IIc가 다른 병기에 비해서 상대적으로 높게 보고 되었다. Stage IIa, IIb에서는 재발률이 각각 33.3%이었고 stage IIc에서는 50%이었다. 또한 stage III에서는 재발이 없었다. 재발되거나 잔여 종양이 발생하였던 환자 7명은 모두 이차 수술을 추가적으로 시행 받았으며 수술 후 병변 없이 추적 관찰되었다. 이차 구제 수술을 포함하면 총 27건의 비인강 혈관섬유종의 수술이 진행 되었고 이를 수술적 접근법에 따라 분석해 보면 내시경적 접근법으로 치료 받은 환자군은 7명으로 재발률은 14.3%(1/7)이었으나 stage IIa 및 stage IIb에서는 병변의 완전한 제거가 가능하였다. Midfacial degloving 접근법으로 치료 받은 환자군은 9명으로 재발률은 33.3%(3/9)이었고 maxillary swing 접근법으로 5명의 환자군이 치료 받았으며 재발된 예는 없었다. 총 27건의 수술 예에서 수술 후 주목할 만한 합병증이 4건(14.8%)의 수술에서 발생 하였다. 발생한 합병증은 추가적인 시술이 필요했으며 maxillary swing 접근법 및 infratemporal fossa 접근법에서 특히 발생되었다. 결론적으로 비인강 혈관섬유종의 치료에 있어서 병변의 완전한 절제 뿐만 아니라 수술 후 발생 가능한 합병증 또한 고려하여 수술적 접근법을 선택해야 한다. 따라서 stage IIa 및 IIb인 병변에 대해서는 내시경적 접근법을 우선적으로 고려할 수 있으며 stage IIc인 병변에 대해서는 병변의 완전한 절제를 위해서는 상대적으로 더 침습적인 수술적 접근법(maxillary swing or infratemporal fossa approach)을

사용하여야 하나 발생 가능한 합병증을 고려한다면 우선적으로 상대적으로 덜 침습적인 수술적 접근법을 권유할 수 있을 것이다. 그러나 stage III 및 재발된 stage IIc인 병변에 대해서는 수술 합병증 보다는 적극적인 병변의 제거가 우선시 되어야 할 것이며 이에 따른 수술적 접근법을 고려해야 할 것이다.

핵심되는 말 : 비인강 혈관섬유종, 재발률, 수술 합병증