Rhinology, 37, 80–85, 1999

Experiences with endonasal surgery in angiofibroma

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SUMMARY

Surgery is the most common treatment for angiofibromas, but the approach is still a major point of discussion. Five cases of angiofibroma with typical localisation were treated surgically by an endonasal approach at the Fulda Academic Teaching Hospital from 1994 to 1997. This article presents an analysis of the clinical findings, computer tomography and magnetic resonance imaging, preoperative embolization, operative technique and complications. Endoscopic and radiologic follow-up ranging from 5 to 39 months excluded any residual tumour or recurrence. The endonasal microendoscopic approach with adequate preoperative embolization should be considered as an useful technique for removing tumours with considerable size without using an external incision.

Key words: Angiofibroma – Surgery – Endonasal Approach – Embolization

INTRODUCTION

Angiofibromas are highly vascular, rare tumours of the nose and nasopharynx that occur almost exclusively in adolescent males. They are usually based at the lateral margin of the posterior nares in the region of the sphenopalatine foramen, but the tissue of origin is still unclear (Ringertz, 1938; Schiff, 1959; Neel et al., 1973; Sessions et al., 1981; Bremer et al., 1986; Harrison, 1987). Although these tumours are benign, they are locally aggressive eroding adjacent bone and growing through natural foramina and fissures. They accounts for less than 0,5 to 0,05% of all head and neck tumours (Waldman et al. 1981, Gullane et al., 1992).

Management of angiofibromas has been a challenge to the head and neck surgeon. Treatment has included surgical excision, electrocoagulation, interstitial or external radiation therapy, cryosurgery, chemotherapy and hormone administration (Tseng et Chao, 1997). Surgical removal, radiation and in rare cases chemotherapy seem to be the only effective treatments (Mahargj et al., 1989).

The efficacy of bleeding control and the location and size of the tumour are crucial factors in treatment choice. The most common method of treatment is surgical removal after hyperselective embolization (Ungkanont et al. 1996). Radiation treatment may reduce tumour size (Fagan et al., 1997), but malignant change in angiofibroma has been reported (Witt et al., 1983). Chemotherapy was recommended only for recurrent angiofibromas, those that extended into the intracranial area and involved vital structures and tumours with their major blood supply from intracranial vessels (Goepfert et al., 1985; Schick et al. 1996).

Many surgical approaches were suggested depending on the tumour size and location. These included the natural orifice of the nose, transpalatal, transzygomatic, transmandibular, transhyoid, transantral, midfacial degloving, lateral rhinotomy with or without extensions such as the upper lip split or concomitant craniotomy (Gullane et al., 1992, Fagan et al. 1997). Here we present our experiences using an endonasal, microendoscopic approach in treating angiofibromas. We highlight the operative strategy and the value and results of this approach.

MATERIALS AND METHODS

Five patients with angiofibroma were treated surgically by an endonasal approach at the Ear, Nose and Throat Department of Fulda Academic Teaching Hospital from December 1994 through October 1997. The five male patients ranged in age from 12 to 28 years.

The main symptom in four patients was nasal obstruction including loss of smell in three cases. Recurrent bouts of spontaneous epistaxis were detected in two patients.

* Received for publication April 15, 1998; accepted July 14, 1998

The diagnosis of angiofibroma was based on a careful clinical evaluation of each patient including histologic and radiographic studies and a thorough review of the history of the manifestations of the patient's illness. Four patients were referred to our department after biopsy had confirmed the diagnosis of angiofibroma. We usually do not perform a preoperative biopsy on typically located angiofibromas, because the procedure is often complicated by severe bleeding.

Computer tomography was carried out in all cases and was combined with magnetic resonance imaging in 4 patients. The angiofibromas were classified in all cases according to Fisch (Table 1) as type II.

Preoperative angiography showed in all cases that the maxillary artery was the main blood supply. Polyvinyl alcohol particles were used for embolization 1 day before surgery in these five cases and in one case platinum wires were also used to occlude a false aneurysm caused by biopsy.

Surgery was performed under general anaesthesia in supine position. The nasal cavity was packed with cotton pledgets saturated with cocaine solution (10 %), which were left in place for 10 to 15 minutes. Nasal endoscopy was performed first to get a better overview about the tumour. Since 1987 our surgical management of angiofibromas has included use of the cell saver system for immediate retransfusion of the patient`s blood after filtration and washing.

There were no major operative complications. In two cases one unit 500cc fresh blood transfusion was given to the patient. Another patient had a slightly diminished sensation in the right cheek after surgery.

The nasal pack was removed after 4 to 12 days depending on the individual situation. Postoperatively the diagnosis was confirmed histopathologically. Patients were hospitalised for 11 to 16 days.

Follow-up consisted of endoscopic examination of the nasal cavity and magnetic resonance imaging after 3 months and then at one-year intervals. In one case a postoperative biopsy at 3 months revealed granulation tissue. The time of follow-up ranged from 5 to 39 months with a median follow-up time of 19 months.

OPERATIVE PROCEDURE AND RESULTS

The general procedure consisted of the following (Figure 1):

Using a microscope, the surgeon first removes the mucosa of the agger nasi, followed by identification of the lacrimal sac. To clarify the anatomical situation, the lamina papyracea and the anterior skull base are explored through an ethmoidectomy

Table 1. Classification of juvenile nasopharyngeal angiofibroma according to Fisch (1983).

Stage I	Stage II	Stage III	Stage IV
Tumour limited to the nasal cavity or nasopharynx without bone destructions	Tumour invading the pterygomaxillary fossa, the maxillary, ethmoid and sphenoid sinuses with bone destructions	Tumours invading the infratemporal fossa, orbit and parasellar region remaining lateral to cavernous sinus	Tumours with massive invasion of the cavernous sinus, the optic chiasmal region or pituitary fossa

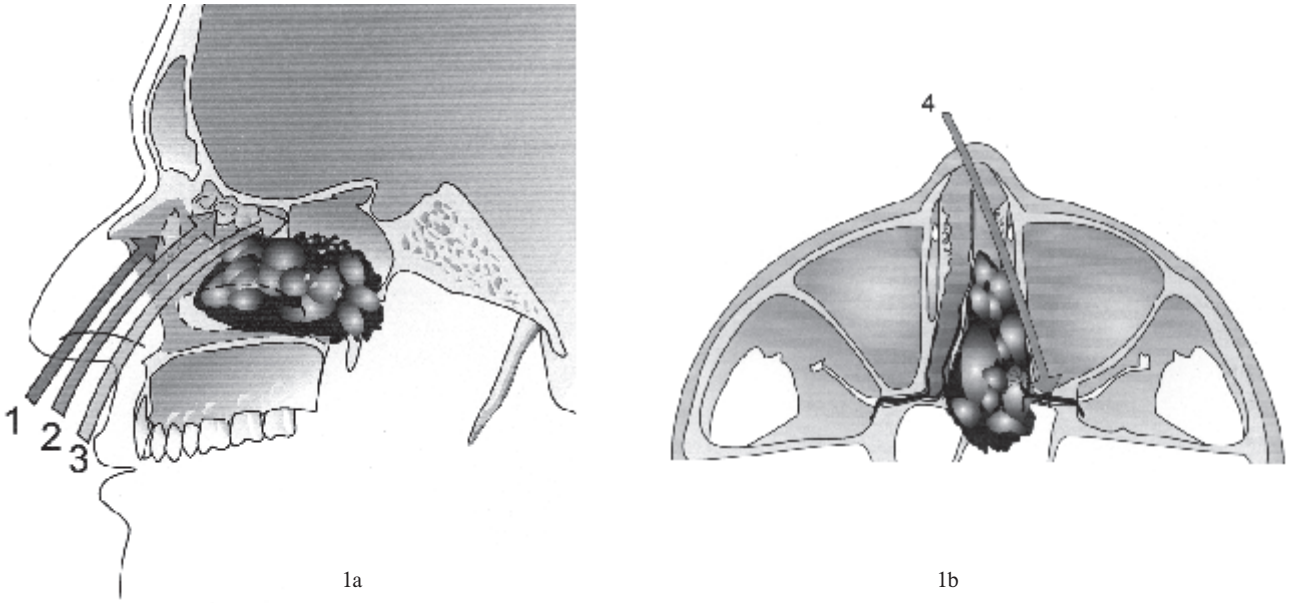
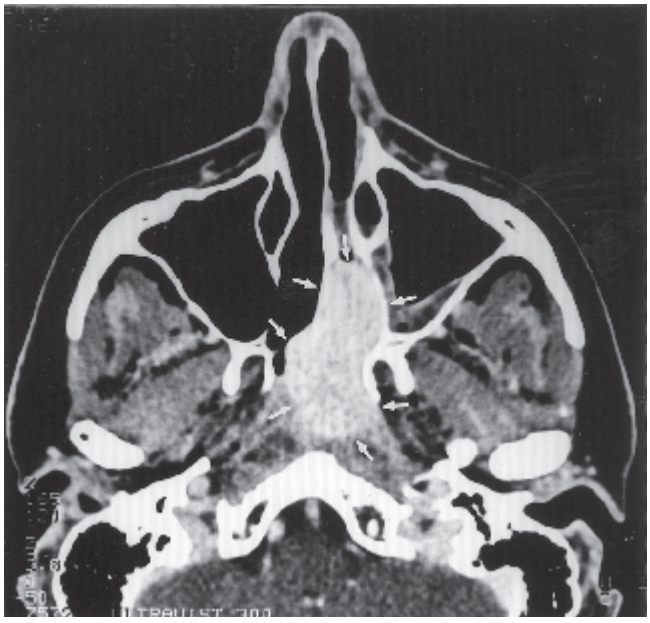


Figure 1. a. Endonasal approach in angiofibroma resection with identification of the agger nasi and lacrimal sac (1), ethmoidectomy to explore lamina papyracea and the anterior skull base (2) and the opening of the sphenoid sinus (3).
b. Removal of the medial third of the posterior maxillary sinus wall to expose the pterygopalatine fossa for clipping the maxillary artery (4).



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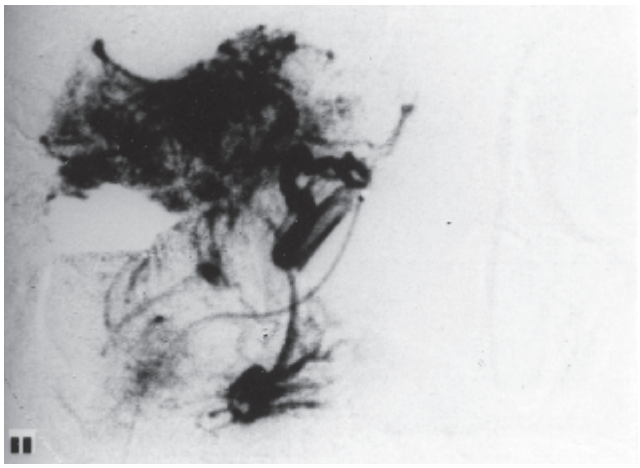

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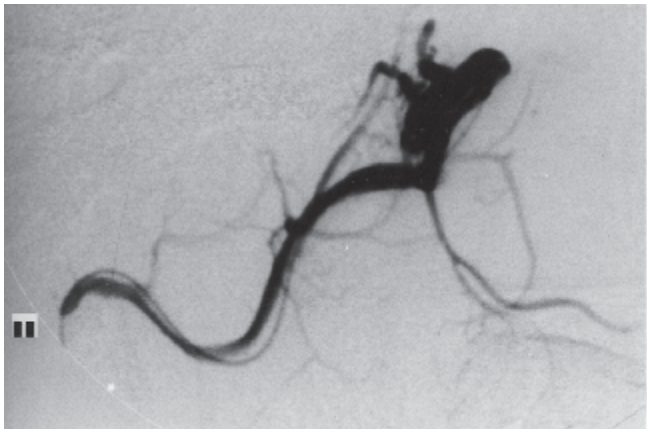

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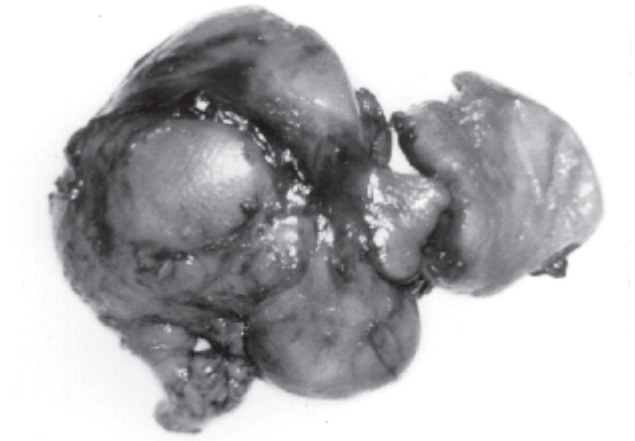

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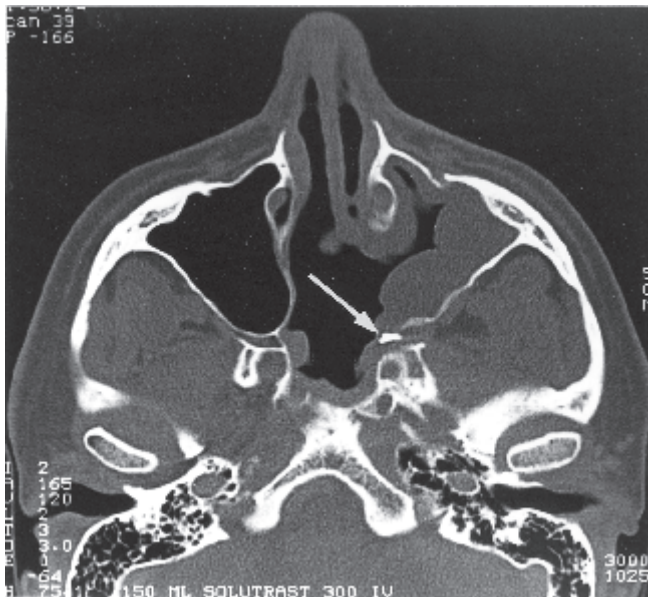

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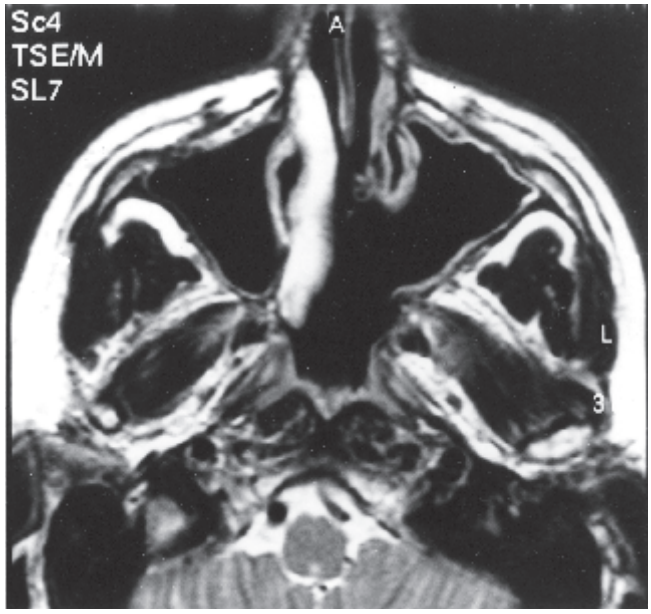

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Figure 2. Axial CT-scan (a) showing contrast enhancement in an angiofibroma of the posterior nasal activity and nasopharynx on the left side in a 28-year-old male patient. Angiogram of the left external carotid artery before (b) and after (c) hyperselective embolization using polyvinyl alcohol particles. Tumour specimen (d) after endonasal en bloc removal of the angiofibroma. Axial CT-scan (e) 3 months postoperatively showing oedematous swelling of maxillary sinus mucosa and the clip (arrow) used to ligate the left maxillary artery. Axial MR view (f) 2 years postoperatively without evidence of recurrence.

Table 2. Clinical, radiological, operative and follow-up data (m = male, 1 = Diagnosis, 2 = Embolization, 3 = Recurrence, * = Classification according to Fisch)

Case	Age of Diag.[1], Sex	Site	Symptoms	Duration of Symptoms	Computer tomography	MRI	Angiography and Embol.[2]	Operative Method	Time of Hospitalisation	Complications	Folllowup	Rec.[3]
1	12 ys, m	right	nasal obstruction, affection of smell sensation	6 months	Vascular tumour (7x4x2.5 cm) in the right posterior nasal cavity and nasopharynx displacing the nasal septum, extending to the posterior ethmoid, sphenoid sinus and pterygopalatine fossa and showing an intratumoural false aneurysm after biopsy outside (type II)*.	+	+	Endonasal, microendoscopic	14 days	one unit 500cc fresh blood transfusion	6 months	-
2	16 ys, m	right	recurrent epistaxis, nasal obstruction	6 months	A mass (5x5x4 cm) occupying the right posterior nasal cavity and nasopharynx extending to the sphenoid sinus with widening of the sphenopalatine foramen (type II)*	+	+	Endonasal microendoscopic	12 days	diminished sensation over the right cheek	12 months	-
3	19 ys, m	left	nasal obstruction, affection of smell sensation	5 years	A mass (3x2.5x1 cm) arising from the sphenopalatine foramen and extending posteriorly to the choana. The floor of the sphenoid sinus and the pterygoid process are infiltrated (type II)*.	+	+	Endonasal, microendoscopic	11 days	no	39 months	-
4	27 ys, m	right	nasal obstruction, affection of smell sensation	1 year	A mass (2.5x4.5x5 cm) occupying the right posterior nasal cavity, nasopharynx, posterior ethmoid and sphenoid sinus (type II)*.	+	+	Endonasal, microendoscopic	16 days	no	5 months	-
5	28 ys, m	left	recurrent epistaxis	2 weeks	4.5x4x2 cm vascular tumour in the nasopharynx and left posterior nasal cavity invading the sphenoid sinus; destruction of the posterior part of nasal septum and clivus; posterior ethmoid system affected (ype II)*.	-	+	Endonasal, microendoscopic	12 days	one unit 500cc fresh blood transfusion	33 months	-

including a partial resection of the middle turbinate. The anterior wall of the sphenoid sinus is removed at this early stage, if necessary.

The medial wall of the maxillary sinus is then removed above the inferior turbinate and behind the lacrimal sac with the sphenopalatine foramen as the posterior margin. The tumour passing the sphenopalatine foramen becomes visible. The medial third of the posterior maxillary sinus wall is then resected to expose the pterygopalatine fossa. The maxillary artery can be identified and clipped.

Then the mucosa around the tumour is incised. Mobilization of the tumour from lateral to medial site is started along the pseudocapsule and the cranial part of the pterygoid process is removed by drilling. In two cases the sphenoid sinus on the opposite side was also opened to improve the overview, the intersphenoidal septum and a part of the posterior nasal septum were then resected. Sometimes it is also necessary to remove the floor of the sphenoid sinus. Finally the tumour is mobilized and microsurgically resected en bloc. Frozen section biopsies are taken from the resection line for histologic evaluation of the margins and careful endoscopic examination is performed at the end of the operation.

Patients data are listed in Table 2 and patient 4's radiological findings are demonstrated in Figure 2.

DISCUSSION

The approach to angiofibroma surgery is a major point of discussion. The major problems with this surgery in the past have been massive intraoperative blood loss, limited view of the affected area and uncertainty about the tumour extension. A variety of approaches were needed to deal with these problems. To select the appropriate surgical approach the surgeon must know the tumour's precise size and location, its vascular supply, the facilities of preoperative embolization and its relation to the neighbouring structures.

Depending on the tumour's size and location, an extracranial or a combined extracranial-intracranial approach can be used. The most important extracranial approaches to us are the endonasal microendoscopic approach, the midfacial degloving technique (Casson et al., 1974) and a recent more rarely used transfacial approach through an extended Moure incision (Moure, 1922). In the early stages of an extracranial angiofibroma limited to the nasal cavity, the ethmoid cell system, the nasopharyngeal roof, the sphenoid sinus and to a certain extent to the pterygopalatine fossa, an endonasal microendoscopic approach can be used to resect the tumour. Wider access to the nasal cavity, the paranasal sinuses, the anterior skull base, the orbit, the pterygopalatine, pterygoid and infratemporal fossa and the clivus allows midfacial degloving. To gain a better overview of large tumours that extend to the pterygopalatine fossa, the infratemporal fossa, the orbit, the parasphenoidal and parasellar regions and even those with some intradural growth, a transfacial approach through a lateral rhinotomy is suitable. Midfacial degloving or lateral rhinotomy can be further combined with a lateral transzygomatic approach. Only in rare cases with tremendous intracranial extension is it necessary to use a combined extra-intracranial approach in order to guarantee sufficient visualization of the tumour and neighbouring structures.

Great progress has been made in endonasal surgery during the last 20 years. The endonasal approach has been used successfully to treat inflammatory diseases of the nose and paranasal sinuses, to treat congenital choanal atresia, to decompress the orbit, to deal with mucopyoceles and to close a cerebrospinal fluid leak of the anterior skull base (Hosemann, 1996). In recent years, the endonasal approach has even been used to treat neoplasms of the nasal cavity and paranasal sinuses. Treatment of inverted papillomas, osteomas, ossifying fibromas and antrochoanal polyps have been described (Hosemann, 1996). Furthermore Kamel (1996), Zicot et Daele (1996), Tseng et Chao (1997), Fagan et al. (1997) and Bernal-Sprekelsen et al. (1998) reported transnasal endoscopic surgery in nine cases of limited juvenile nasopharyngeal angiofibroma. An additional 14 angiofibromas were resected at the ENT University Hospital Graz using the endonasal endoscopic approach (Stammberger, 1998).

As of October 1997, we had treated 105 tumours by an endonasal approach including 5 angiofibromas with typical localisation. We prefer to use a combined microendoscopic technique in endonasal tumour surgery. Using a self-retracting speculum or having the assistant hold the speculum, the surgeon is able to work under a microscope with both hands. It is possible to completely excise the tumour under direct vision. Careful endoscopic examination of the preoperative situation and the cavity after tumour resection is valuable as is the opportunity for frozen section biopsy of soft tissue from the resection line. The endonasal approach requires extensive experience in paranasal sinus surgery and in head and neck tumour surgery in general. The surgeon must be acquainted with possible complications and short-term follow-up using an endoscope, furthermore, CT and MR imaging is mandatory.

This small sample of five angiofibromas treated via an endonasal approach does not allow us to compare the microendoscopic technique with other more frequently used approaches that have long term follow-up. At this point, we can only describe our experiences in endonasal treatment of angiofibromas. The endonasal approach has proven to be valuable in resecting space occupying lesions of the nose and paranasal sinuses including angiofibromas of considerable size. So far, we have not observed any recurrence of angiofibroma in the five patients treated by endonasal resection. Endonasal treatment is therefore chosen in cases of angiofibromas that have growth into the nasal cavity, paranasal sinuses and nasopharynx, and also those tumours that have a limited growth to the pterygopalatine fossa (types I and II according to Fisch). Dissecting the angiofibroma by following the pseudocapsule of the tumour and performing preoperative embolization generally prevent severe bleeding and allows en bloc resection of the tumour. Preoperative angiography, demonstrating the ability to ligate the feeding vessel prior to tumour mobilization is another prerequisite to the endonasal approach. Clipping the maxillary or sphenopalatine artery as feeding vessel before mobilization of the tumour is of tremendous benefit in endonasal treatment of angiofibromas.

Our first five cases of endonasal removal of typical located angiofibromas demonstrate that this is a suitable approach for a selected group of small and average size angiofibromas. Although angiofibroma can recur after all treatment modalities, both surgical and conservative, our series showed no recurrence, low morbidity and only minor complications like diminished sensation over the right cheek.

CONCLUSION

As surgical experience in treating space occupying lesions of the nose and paranasal sinuses increases, the value of the endonasal approach in angiofibroma has to be seen in the context of more extensive approaches. The surgeon considers individual anatomy, pathology, blood supply, location and size of the tumour, but ultimately his or her personal experience is the deciding factor. The goal is a safe technique that allows a complete tumour resection. In addition the surgeon will aim to achieve the best possible functional and aesthetic result. There is no doubt that the endonasal route combined with sufficient preoperative embolization is becoming increasingly important in angiofibroma resection.

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