



## A false traumatic giant aneurysm of the supraclinoid carotid artery. A case report and review of the literature

Mustafa K. Baskaya, Nurullah Yüceer & Nihat Egemen

To cite this article: Mustafa K. Baskaya, Nurullah Yüceer & Nihat Egemen (1996) A false traumatic giant aneurysm of the supraclinoid carotid artery. A case report and review of the literature, *Neurological Research*, 18:2, 135-139, DOI: [10.1080/01616412.1996.11740391](https://doi.org/10.1080/01616412.1996.11740391)

To link to this article: <http://dx.doi.org/10.1080/01616412.1996.11740391>



Published online: 21 Jul 2016.



Submit your article to this journal [↗](#)



View related articles [↗](#)



Citing articles: 6 View citing articles [↗](#)

# A false traumatic giant aneurysm of the supraclinoid carotid artery. A case report and review of the literature

Mustafa K. Başkaya, Nurullah Yüceer\* and Nihat Egemen\*

Division of Neurosurgery, Department of Surgery, University of Kentucky Medical Center, Lexington, Kentucky, USA and  
\*Department of Neurosurgery, Ankara University, School of Medicine, Ibni Sina Hospital, Ankara, Turkey

A patient presented with left hemiparesis and facial palsy developed 20 days after a traffic accident. A computerized tomography (CT) scan revealed right suprasellar mass lesion. A repeated CT scan revealed a growing mass. Carotid angiogram demonstrated a giant aneurysm of the supraclinoid internal carotid artery (ICA) with no distal filling. Formation of the aneurysm was thought to be due to an overstretching or torsion of the artery or tearing of the ICA by nearby prominent bony structure since no basal skull fracture was detected in the plain skull film or CT scans. The aneurysm was treated by intracranial trapping of the ICA. We present this patient's findings and review previously reported cases in the literature. [Neurol Res 1996; 18: 135-139]

Keywords: Head trauma; internal carotid artery; traumatic aneurysm; trapping

## INTRODUCTION

Less than 1% of all intracranial aneurysms are caused by trauma; these aneurysms are rarely a complication of traumatic head injury<sup>1-3</sup>. Traumatic cerebral aneurysms that occur after penetrating or nonpenetrating head injuries of iatrogenic vascular injuries<sup>4-8</sup> are usually located on branches of the distal cerebral arteries such as the anterior or middle. Traumatic aneurysms of the intracranial internal carotid artery (ICA), which are infrequent, are often encountered in the petrous or cavernous segments. Only 34 cases of traumatic aneurysms of the supraclinoid ICA have been reported<sup>2,5,6,9-27</sup>. These traumatic aneurysms are not only rare, but they can easily be missed on initial examination and their management is challenging. Early diagnosis and appropriate surgical treatment improve the outcome.

We report a case of traumatic aneurysm of the supraclinoid ICA and a review of the previously reported occurrences of aneurysm in this rare location.

## CASE REPORT

A 27-year-old man who was involved in a traffic accident had been admitted to another hospital. His initial physical examination revealed an open tibia fracture and bruising of his face and scalp. His neurological examination at admission was normal. No fracture showed on the plain x-ray of his skull. The patient underwent surgery for the tibia fracture. During the operation, he developed signs of mild malignant hyperthermia but his recovery from anesthesia was

smooth. Results of routine post-operative tests, including serum electrolyte, urine, and blood gases, were within normal limits. Twenty days after admission, however, he experienced sudden onset of left hemiparesis and facial paresis and these became worse. Computerized tomography (CT) scan of the patient's head revealed a hyperdense mass lesion in the right parasellar and suprasellar regions and a slight subarachnoid hemorrhage on the right sylvian cistern (Figure 1). He was transferred to the Department of Neurosurgery, Ankara University, Ibni Sina Hospital. Three days later, the patient underwent a repeat CT scan that showed the mass to be expanding dramatically. A four-vessel angiogram showed that the mass was a giant aneurysm of the right supraclinoid ICA with no distal filling (Figure 2a). When the right carotid artery was compressed low in the neck, good cross-filling of the right hemisphere was observed (Figure 2b). Because his neurological condition was becoming gradually worse, the patient underwent CT examination again just before emergency operation to repair the aneurysm. This CT scan also showed a huge hyperdense parasellar mass (Figure 3). An operation was performed via a right frontotemporal craniotomy. At the same time the right carotid artery in the neck was exposed. The sylvian fissure was opened. A giant aneurysm with very thin, fragile walls and a broad-based neck were seen. The aneurysm wall was dissected free from the surrounding cortex. The base of the aneurysm extended at least 8 to 9 mm. The aneurysm ruptured and was trapped by occluding the ICA just proximal to the ophthalmic artery and distal to the neck. The wall of the aneurysm was formed by thickened arachnoid and surrounding cortex. The patient's post-operative course was uneventful. A post-operative carotid angiogram revealed the trapped ICA.

Correspondence and reprint requests to: Mustafa K. Başkaya, MD, Department of Neurosurgery, University of Kentucky Medical Center, 800 Rose Street, Lexington, Kentucky 40536-0084 USA. Accepted for publication October 1995.

Six months after operation, a follow-up examination showed well-improved, very mild hemiparesis that does not restrict the patient's daily activities.

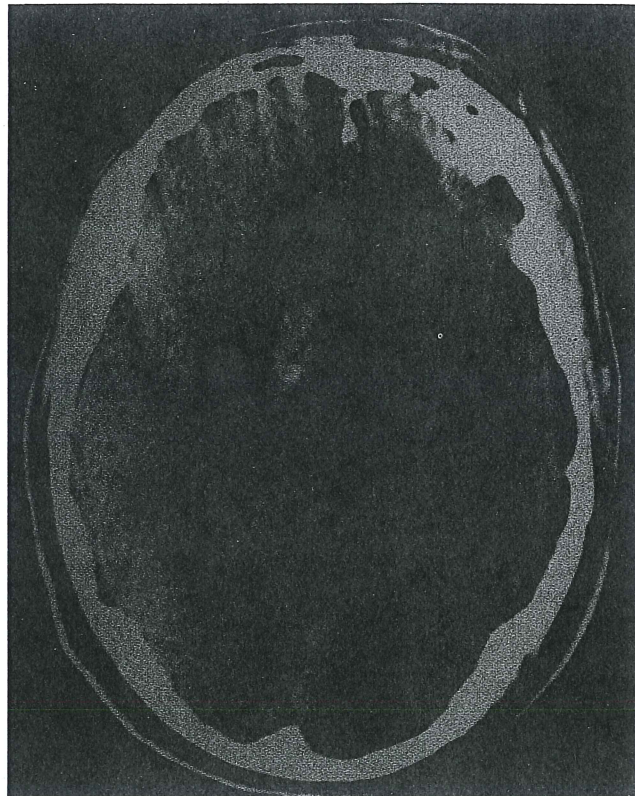
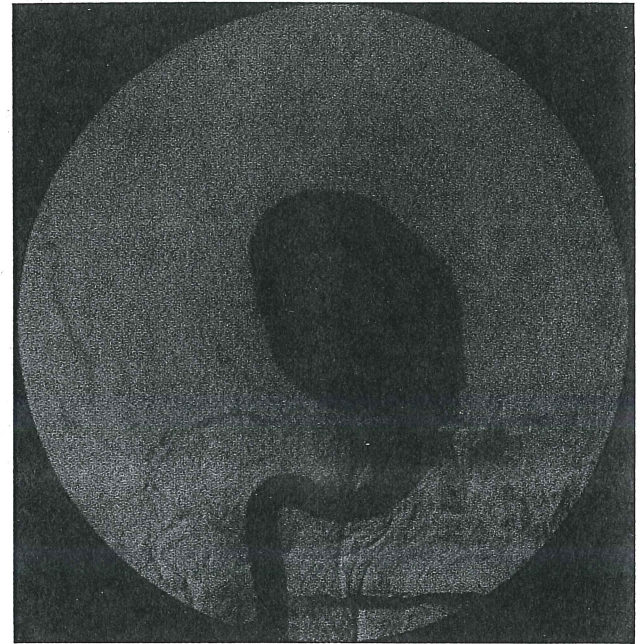
## DISCUSSION

Traumatic intracranial aneurysms comprise less than 1% of intracranial aneurysms<sup>1-3</sup>. Laun's study of 73 traumatic aneurysms showed that 27% were located on the meningeal, 40% on the middle cerebral, and 13% on the anterior cerebral arteries<sup>28</sup>. The next most frequent site is the petrous or cavernous segment of the ICA<sup>1</sup>. Reviewing the literature, we found only 34 cases of traumatic aneurysms of the supraclinoid ICA.

Parkinson and West<sup>18</sup> have suggested the following diagnostic criteria to distinguish traumatic from congenital aneurysms: 1. history of trauma; 2. site of aneurysm; 3. age of patient; 4. histological findings. Our review of the literature revealed that most previously reported cases occurred in male patients (69%) and in patients less than 30 years old (49%).

Traumatic aneurysms are classified into three main groups according to their pathogenesis: dissecting, true, and false aneurysms. A dissecting aneurysm is formed when disrupted intima and internal elastica allow blood to dissect these two layers from the muscularis. True aneurysms develop as a result of incomplete rupture of the arterial wall that leaves the adventitia intact<sup>10,25</sup>.

False aneurysms develop as a result of complete interruption of the arterial wall with formation of a perivascular hematoma that subsequently develops a fibrous wall by organization; its hemodynamic



**Figure 1:** Computed tomography (CT) scans, performed at another hospital on twenty-first day after injury showed a right hyperdense parasellar mass lesion and light subarachnoid hemorrhage on the right sylvian cistern

**Figure 2 a:** A right carotid angiogram showing a giant aneurysm of the supraclinoid internal carotid artery with no distal filling. **b:** A left carotid angiogram showing good cross filling of the right hemisphere when the right carotid artery was compressed in the neck

**Table 1:** Summary of previously reported cases of traumatic aneurysm of the supraclinoid internal carotid artery

Author (year)	Age/Sex	Type of injury	Basal skull fracture	Presentation/interval	Type of aneurysm	Treatment	Outcome
Alexander (1963)	56/M	Iatrogenic	-	Asymptomatic 4.5 months	Unknown	-	Unknown
Salmon (1968)	24/M	Closed head trauma	-	EDH 7 days	Unknown	-	Unknown
Dechaume (1969)	15/M	Closed head trauma	-	Asymptomatic	Unknown	Wrapping	Improved
Benoit (1973)	45/M	Closed head trauma	+	SAH 11 days	Unknown	Trapping	Unknown
Dharker (1975)	17/M	Closed head trauma	+	Hemiparesis 5 years	Unknown	-	Death
Funahashi (1977)	15/M	Closed head trauma	-	SAH 9 days	Unknown	Neck ligation	Improved
Parkinson (1980)	11/M	Closed head trauma	+	decerbrate 1 day	False	-	Death
	27/F	Closed head trauma	-	SAH 1 day	False	-	Death
	43/M	Iatrogenic	-	ICH 9 days	False	Trapping	Death
Yonas (1980)	45/M	Closed head trauma	-	Asymptomatic	True	Carotid ligation	Unchanged
Reddy (1981)	14/M	Closed head trauma	-	Loss of vision 5 days	False	Trapping	Improved
Pozzati (1982)	17/M	Closed head trauma	-	6th nerve palsy 5 days	Unknown	Carotid ligation	Improved
	16/M	Closed head trauma	-	Loss of vision 25 days	Unknown	Carotid ligation	Improved
Shigemori (1982)	22/M	Closed head trauma	-	SAH, IVH 17 days	Unknown	Carotid ligation	Unchanged
Enomoto (1984)	45/M	Closed head trauma	+	SAH 1 day	False	Trapping	Death
Jakobsson (1984)	24/5/M	Closed head trauma	+	SAH 15 days	False	Trapping	Improved
	42/M	Closed head trauma	+	ICH 4 days	False	-	Death
Kieck (1984)	Unknown	Stab wound	Unknown	Unknown	Unknown	Surgical treatment	Improved
	Unknown	Stab wound	Unknown	Unknown	Unknown	Surgical treatment	Improved
Salcman (1985)	42/M	Closed head trauma	-	SAH, IVH 1 day	Unknown	Carotid ligation	Improved
Steinmetz (1988)	23/M	Closed head trauma	-	Hemiparesis 5 years	Unknown	Carotid ligation	Unknown
Bousquet (1989)	20/M	Closed head trauma	-	Hemiparesis, 3rd nerve palsy 16 days	False	Excision, repair	Improved
Haddad (1991)	26/M	Missile wound	-	Unknown	Unknown	No surgical treatment	Unknown
Weinstein (1991)	28/M	Unknown	Unknown	Loss of vision	False	Neck ligation	Improved
Saito (1992)	35/F	Iatrogenic	-	ICH, IVH 2 months	Unknown	IC ballon occlusion	Improved
	35/F	Iatrogenic	-	ICH 2 weeks	Unknown	IC ballon occlusion	Improved
Li (1994)	25/M	Closed head traum	Unknown	Confusion, leg weakness	False	Carotid ligation	Improved
Present case	27/M	Closed head trauma	-	Hemiparesis, facial paresis	False	Trapping	Improved

In the series of du Trevou (1992), 7 patients had traumatic aneurysms of the supraclinoid ICA due to penetrating stab wounds. Exact data about these patients were not described by the authors. EDH, epidural hematoma; F, female; IC, internal carotid; ICH, intracerebral hematoma; IVH, intraventricular hemorrhage; M, male; SAH, subarachnoid hemorrhage

excavation or repeated hemorrhage causes the increase in size<sup>10,25</sup>. Of the previously reported cases of traumatic supraclinoid ICA aneurysms, only 12 (including our case) were diagnosed either operatively or histologically (11 false aneurysms and 1 true aneurysm) (Table 1). In our patient, the diagnosis was false traumatic aneurysm because the wall of the aneurysm was formed by thickened arachnoid and because we did not see any normal vascular structures, such as adventitia, after the aneurysm was trapped.

Traumatic aneurysms occur after penetrating injury or closed head trauma, the latter being more common<sup>4-8</sup>. A traumatic aneurysm of supraclinoid ICA following closed head trauma may be due to one of these mechanisms: a basal skull fracture may cause direct injury to the ICA, overstretching or torsion of the carotid artery during the impact of head injury may cause injury, and the ICA may be torn by nearby prominent bony structures such as the anterior or posterior clinoid processes<sup>2,6,10,22,25</sup>. Twenty of the previously reported cases including our case were caused by closed head trauma, only 6 of them as a result of basal skull fractures. The remaining causes of injury included penetrating stab wounds (9 patients), iatrogenic trauma during the intracranial or transsphenoidal surgery (4 patients), missile wound (1 patient) (Table 1). In our patient, the aneurysm was located on the ICA just distal to the ophthalmic artery. Formation of traumatic aneurysm at this location may be caused by several factors. In the absence of a basal skull fracture, the injury to the ICA may be caused by blunt contusion produced by a severe impingement of the artery on the overlying anterior clinoid process or by overstretching or sudden torsion of the vessel during brain movements within the calvaria.

Traumatic aneurysm is thought to rupture at a given interval after the head injury, most often at 2 to 3 weeks<sup>1,5,10,11,21</sup>. In our review of the literature, we found that the interval ranged from a few hours to 5 years after head injury, with a peak at 2 weeks. In 12 cases, the patients presented with intracranial hemorrhages, most of which ( $n=7$ ) were subarachnoid hemorrhages. In 6 cases, the patients presented with progressive neurological deficits and in 3 cases presented with visual loss. In 10 cases the patients' presenting problems are unknown (Table 1).

The radiological diagnosis of traumatic aneurysms is made by angiography. Angiographically, traumatic aneurysms differ from congenital aneurysms in their site (away from arterial division), their often irregular outline, and their slow hemodynamics (delayed filling and emptying of aneurysmal sac). The neck of the aneurysm sometimes cannot be detected easily.

Most of the reported traumatic aneurysms of the supraclinoid ICA, including the present case, were treated by trapping or carotid ligation in the neck (13 cases) but in a recent case reported by Bousquet *et al.*<sup>11</sup>, aneurysm excision and microsurgical repair of the vessel were performed, and the patient improved post-operatively. Saito *et al.*<sup>20</sup> suggested that balloon occlusion of the carotid artery is effective and relatively easy for treatment of this lesion. Yonas and Dujovny<sup>25</sup> stated that

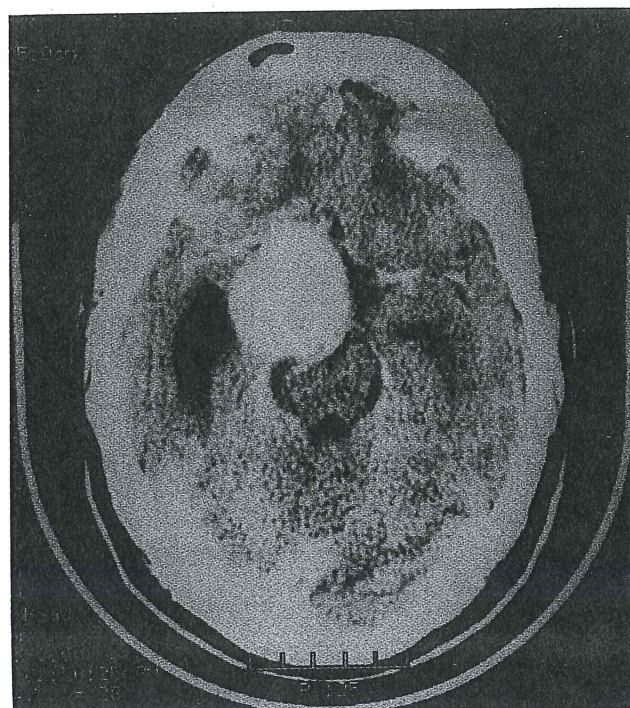


Figure 3: CT scans on twenty-sixth day after injury showed hydrocephalus and a mass lesion that had reached huge size

early, direct surgical treatment of these traumatic aneurysms should be avoided until after a maturation process, which was described by Thompson *et al.*<sup>29</sup> as thickening, thrombosis, or calcification of the aneurysm wall. However, traumatic aneurysm of the supraclinoid ICA seems to have a high rebleeding rate and therefore, the patient may die during this waiting period. Parkinson and West who pointed out the importance of early diagnosis and surgical treatment, reported that the mortality rate is 50% in untreated cases<sup>18</sup>. Although two successful surgical treatment types have been reported [excision of the aneurysm followed by microsurgical repair of the ICA<sup>11</sup> and ligation of the aneurysmal neck<sup>14</sup>] direct surgery on these aneurysms is difficult because of their fragile, broad-based, and obscure necks. Of the 13 patients who were treated by trapping or ligation, 2 died. Of the 26 patients treated surgically, 6 died (26%). However, since the exact clinical data were not available for 15 patients (43%) in the literature we could not determine an exact relationship between treatment and outcome (Table 1).

In conclusion, a traumatic aneurysm of the supraclinoid ICA is association with high mortality and morbidity rates. These aneurysms are difficult to repair because they are false aneurysms and because most of these lesions have broad-based, fragile, and obscure necks. Early diagnosis and surgical treatment are most important points in the management of traumatic aneurysm of supraclinoid ICA.

#### ACKNOWLEDGEMENT

The authors thank Ms. Sherry Williams for editorial assistance.

REFERENCES

- 1 Fleischer AS, Patton JM, Tindall GT. Cerebral aneurysms of traumatic origin. *Surg Neurol* 1975; **4**: 233–239
- 2 Shigemori M, Shirahama M, Hara K, Tōkutomi T, Kawaba T. Traumatic aneurysms of intracranial internal carotid arteries: Case reports. *Neurol Med Chir (Tokyo)* 1982; **22**: 241–247
- 3 Buckingham MJ, Crone KR, Ball WS, et al. Traumatic intracranial aneurysms in childhood: Two cases and review of the literature. *Neurosurgery* 1988; **22**: 398–408
- 4 Aarabi B. Traumatic aneurysms of brain due to high velocity missile head wounds. *Neurosurgery* 1988; **22**: 1056–1063
- 5 Enomoto H, Shibata T, Ito A, Harada T. Traumatic aneurysms of the supraclinoid internal carotid artery: Report of a case. *Neurosurgery* 1984; **15**: 700–702
- 6 Pozzati E, Gaist G, Servadei F. Traumatic aneurysms of the supraclinoid internal carotid artery. Repeat of two cases. *J Neurochir* 1982; **57**: 418–422
- 7 Rahimizadeh A, Abtahi H, Daylami MS, Tabatabaei MA, Haddadian K. Traumatic cerebral aneurysms caused by shell fragments. Report of four cases and review of the literature. *Acta Neurochir (Wien)* 1987; **84**: 93–98
- 8 Wang AN, Winfield JA, Gucer G. Traumatic internal carotid artery aneurysm with rupture into the sphenoid sinus. *Surg Neurol* 1986; **25**: 77–81
- 9 Alexander E, Adams JE, Courtland HD. Complications in the use of temporary intracranial arterial clip. *J Neurosurg* 1963; **20**: 810–811
- 10 Benoit BG, Wortzman G. Traumatic cerebral aneurysms. Clinical features and natural history. *J Neurol Neurosurg Psychiatry* 1973; **36**: 127–138
- 11 Bousquet C, Lejeune JP, Christiaens JL. Traumatic aneurysm of the supraclinoid internal carotid artery. Case report. *Surg Neurol* 1989; **31**: 319–322
- 12 Dechaume J-P, Cuhe M, Requin J-L. Les rapports des traumatismes crâniens et des anévrismes artériels intracrâniens (à propos de huit observations). *Med Leg Domm Corpor (Paris)* 1969; **2**: 3–20
- 13 Dharker SR, Chandy MJ, Chandy SM, Abraham J. Giant traumatic aneurysm of the intracranial carotid artery: Case report. *Neurol India* 1975; **23**: 207–209
- 14 Funahashi K, Mishima T, Hayashi S, Kishi M, Oka M. Traumatic aneurysm of intracranial portion of the internal carotid artery. Report of a case in which the development of aneurysm was documented by several carotid angiographies. *No Shenkei Geka* 1977; **5**: 619–625
- 15 Haddad FS, Haddad GF, Taha J. Traumatic intracranial aneurysms caused by missiles: Their presentation and management. *Neurosurgery* 1991; **28**: 1–7
- 16 Jakobsson KE, Carlsson C, Elfverson J, von Essen C. Traumatic aneurysms of cerebral arteries. A study of five cases. *Acta Neurochir (Wien)* 1984; **71**: 91–98
- 17 Kieck CF and de Villiers JC. Vascular lesions due to transcranial stab wounds. *J Neurosurg* 1984; **60**: 42–46
- 18 Parkinson D, West M. Traumatic intracranial aneurysms. *J Neurosurg* 1980; **52**: 11–20
- 19 Reddy SVR, Sundt TM Jr. Giant traumatic false aneurysm of the internal carotid artery associated with a carotid-cavernous fistula. Case report. *J Neurosurg* 1981; **55**: 813–818
- 20 Saito R, Yazaki T, Kawase T, Toya S. Traumatic intracranial aneurysm after removal of tuberculum sellae meningioma: Case report. *No Shenkei Geka* 1992; **20**: 973–977
- 21 Salcman M, Botero E, Bellis E. Giant post-traumatic aneurysm of the intracranial carotid artery: Evolution and regression documented by computed tomography. *Neurosurgery* 1985; **16**: 218–221
- 22 Salmon JH, Blatt ES. Aneurysm of the internal carotid artery due to closed trauma. *J Thorac Cardiovasc Surg* 1968; **56**: 28–32
- 23 Steinmetz H, Heiss E, Mironov A. Traumatic giant aneurysms of the intracranial carotid artery presenting long after head injury. *Surg Neurol* 1988; **30**: 305–310
- 24 du Trevou MD, van Dellen JR. Penetrating stab wounds to the brain: the timing of angiography in patients presenting with the weapon already removed. *Neurosurgery* 1992; **31**: 905–912
- 25 Yonas H, Dujovny M. True traumatic aneurysm of the intracranial internal carotid artery: Case report. *Neurosurgery* 1980; **7**: 499–502
- 26 Weinstein JM, Rufenacht DA, Partington CR, et al. Delayed visual loss due to trauma of the internal carotid artery. *Arch Neurol* 1991; **48**: 490–497
- 27 Li MS, Smith BM, Espinosa J, et al. Nonpenetrating trauma to the carotid artery: seven cases and a literature review. *J Trauma* 1994; **36**: 265–272
- 28 Laun A. Traumatic aneurysms: survey. In: Pia HW, Langmaid C, Zierski J, eds. *Cerebral Aneurysms: Advances in Diagnosis and Therapy*, Berlin: Springer Verlag, 1979: pp. 364–375
- 29 Thompson JR, Harwood-Nash DC, Fitz CR. Cerebral aneurysms in children. *Am J Roentgenol Radium Ther Nucl Med* 1973; **118**: 163–175