

The Role of Computed Tomography Angiography in Temporal Bone Fractures

Yarah M. Haidar MD, Omid Moshtaghi BS, Anadjeet Khaheera BS, Afsheen Moshtaghi BS, Harrison W. Lin MD, Hamid R. Djalilian MD



Abstract

Objectives: To characterize patients presenting with petrous temporal bone fractures (TBF) who underwent a computed-tomography angiography (CTA).
Study design: Retrospective case series.
Methods: Patients presenting with all types of TBF and underwent CTA at our academic institution from 2012 to 2016 were retrospectively reviewed. All CTAs was performed in the context of a traumatic injury. The patients mechanism of injury, type of fracture, and any positive findings were recorded.
Results: Seventy-seven patients with TBF who underwent a CTA were included. The average age of those included was 41 years old (range 9-85 years). Fifty-eight were males (75%). Blunt trauma was the most common type of injury (72 cases). Fall (44.2%) and motor vehicle accidents (44.2%) were the most common mechanisms of injury. Fractures were most commonly longitudinal (50.0%), with some transverse (20.5%) and mixed (27.3%) fractures. Intracranial injury, spinal injury and death occurred in 69, 27, and 14 patients, respectively (89.6%, 35.1% and 18.2%). The fracture involved the carotid canal (CC) in 14 patients (18%). Positive findings on CTA included aneurysm (n=3), carotid injury/dissection (n=2), and incidental findings unrelated to the trauma (n=4). The incidences of orbit fracture (42.9% vs 8.9%, p=0.002) and death (33.3% vs 12.5%, p=0.048) were significantly higher among the patients with positive CTA results. Patients with CC fracture had fewer cases of hemotympanum (7.1% vs 47.6%, p=0.005, OR=0.08), higher incidence of orbit fracture (42.9% vs 12.7%, p=0.016, OR=5.16), and higher incidence of mortality (42.9% vs 12.7%, p=0.016, OR=5.16).
Conclusions: Of the 77 patients with TBF, 14 patients (18%) had evidence of carotid canal fracture. While 5 patients demonstrated an aneurysm or carotid injury on CTA, the CTA did not change medical management in any of these cases.

Introduction

- Objectives: To identify which patients had positive CTA findings and characterize their demographic and clinical findings, to determine which patient characteristics are most likely associated with CTA injury.

Methods and Materials

- IRB approval was obtained.
- Retrospective chart review of all patients with TBF between 2012 and 2016 who presented to our tertiary academic center who had a CTA performed.
- CT scans were reviewed and TBF were characterized.
- Patient characteristics and outcomes were recorded.
- Chi square analysis and independent samples t-test were used for dichotomous and continuous variables respectively for statistical analysis; p-value < 0.05 was considered statistically significant.

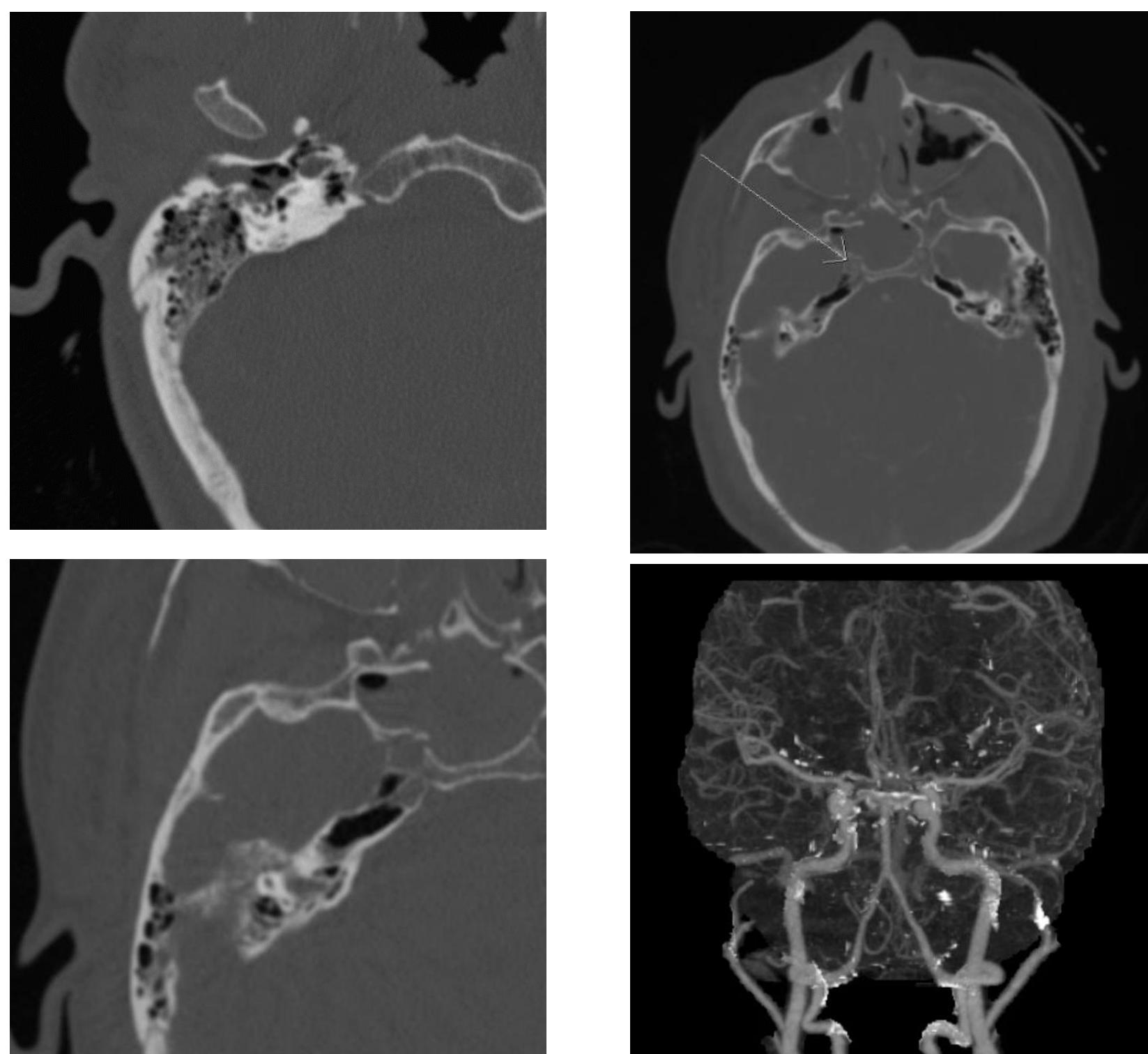


Figure 1: Right longitudinal temporal bone fracture with small dissection of the right ICA on CTA

Results

- Blunt trauma was the most common type of injury (n=72); Fall (n=34, 44.2%) and motor vehicle accidents (n=34, 44.2%) were the most common mechanism.
- 54 patients had no CTA-specific findings (70.1%).
- CC fracture found was found in 14 patients (67%), aneurysm in 3 (14%), carotid artery injury or dissection in 2 (10%) and incidental findings unrelated to the trauma in 4 (19%).
- Hemotympanum was observed more commonly in those a with negative CTA (19.0% vs 48.2%, p=0.02).
- For those with CC fracture or positive CTA results, orbit fracture was seen in 42.9% and death in 33.3%, both statistically different compared to the negative CTA group (p=0.002, p=0.048 respectively).
- Although the incidence of spinal injury was seemingly higher in the CC fracture or positive CTA group, a significant difference was not achieved (52.4% vs 28.6%, p=0.051).

Table 1: Patient demographics

Demographics	n (%) unless indicated otherwise
Age (years)	Range: 9-85 (Mean±SD: 41.39±19.49)
Male	58 (75.3%)
Type of injury	
Blunt trauma	72 (96%)
Penetrating trauma	3 (4%)
Mechanism of injury	
Fall	34 (44.2%)
Motor vehicle accident	34 (44.2%)
Assault	6 (7.8%)
Other	3 (3.9%)
Type of fracture	
Longitudinal	22 (50.0%)
Mixed	12 (27.3%)
Transverse	9 (20.5%)
Other	1 (2.3%)
Intracranial injury	69 (89.6%)
SAH	61 (79.2%)
SDH	39 (50.6%)
EDH	13 (16.9%)
ICH	10 (13.0%)
Spinal injury	27 (35.1%)
Cervical	14 (18.2%)
Thoracic	8 (10.4%)
Lumbar	10 (13.0%)
Sacral	5 (6.5%)
Death	14 (18.2%)

Table 2: CTA results comparison

	Overall (N=77)	CC fracture or positive CTA finding (n=21, 27.3%)	Negative finding (n=56, 72.7%)	P value
Age (Mean±SD)	41.39 ± 19.49	46.52 ± 19.79	39.46 ± 19.19	0.158
Male	75.3%	71.4%	76.8%	0.627
Hemotympanum	40.3%	19.0%	48.2%	0.020
Orbit fracture	18.2%	42.9%	8.9%	0.002
Maxilla fracture	23.4%	38.1%	17.9%	0.075
Frontal bone fracture	16.9%	4.8%	21.4%	0.100
Cranial nerve deficit	28.6%	38.1%	25.0%	0.257
EDH	16.9%	4.8%	21.4%	0.100
ICH	13.0%	14.3%	12.5%	1.000
SAH	79.2%	90.5%	75.0%	0.209
SDH	50.6%	47.6%	51.8%	0.745
Spinal injury	35.1%	52.4%	28.6%	0.051
Surgery needed	39.0%	23.8%	44.6%	0.095
Death	18.2%	33.3%	12.5%	0.048

Conclusions

- In total, 14 patients (23%) with TBF demonstrated a CC fracture; 5 patients demonstrated ICA injury/dissection or aneurysm on CTA.
- Positive CTA findings was also associated with orbit fractures, death, and the absence of hemotympanum, as compared to those with a negative CTA.

Contact

Please address correspondence to:
 Hamid Djalilian
 hdjalili@uci.edu

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