

# DOES CT ANGIOGRAPHY CHANGE THE DECISION OF C2 PEDICLE SCREW IN POSTERIOR SUBAXIAL CERVICAL FUSION?

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# INTRODUCTION

- Biomechanical and clinical studies reveal a superior stabilizing effect of pedicle screw fixation in axis
- But injury of vertebral artery is one of the most serious complication of C2 pedicle screw
- Usually, CT is used in preoperative evaluation of axis for screw technique
- Widely variable anatomy of C2 can create a challenge for decision of instrumentation

## QUESTIONS / AIM

- Can we have some additional useful information about surgical anatomy with CT Angiogram (instead of CT which is routinely used)?
- And can this information (which comes from CTA), help us in order to prevent vascular complications?

# C2 Screw Complications in Literature

## Pedicle screw

- ✓ Cortical bone breach
- ✓ **Vertebral artery injury (4-6 %)**
- ✓ Root injury
- ✓ Spinal cord injury
- ✓ Dural tear

## Translaminar screw

- ✓ Laminar cortical breach
- ✓ Dural tear
- ✓ Spinal cord injury

# Axis investigation with CT or CTA

## CT

- ✓ Axis pedicle width
- ✓ Isthmus thickness
- ✓ Internal height of the vertebral artery (VA) groove for identification of high-riding VA

## CTA-(additional data to CT)

- ✓ Dominancy of VA
- ✓ Extra-axis VA anomalies
- ✓ Variations and loops in VA trajectory
- ✓ Distance between VA and related bony cortices
- ✓ Incidental carotid stenosis or anomalies



✓ **2010-2015**

✓ **Subaxial posterior cervical fusion extended to C2**

– **72 patients totally**

- **Preop. CT investigation 40 patients**
- **Preop. CTA investigation 32 patients**



- ✓ **Pedicle screw for C2 is the first choice in our practice**
- ✓ **Bilateral translaminar or translaminar+pedicle combined screws were used when an anatomical risc was encountered in CT or CTA**
- ✓ **In CT group, it is cancelled pedicle screw decision in 2/40 patients ( 5 %) with preop CT**
- ✓ **In patients which are preoperatively evaluated with CTA, additional information caused to give up bilateral pedicle screw strategy in 8/32 patients (25 %)**

	<b>Bilateral Pedicle screw</b>	<b>Bilateral translaminar screw</b>	<b>Combined screws</b>	<b>Total</b>
CT group	38 (95 %)	1	1	40
CTA group	24 (75 %)	5	3	32
				72

## ✓ Screw related vascular complications

### – CT group.....2 patients

- Abondant VA bleeding in surgery, urgent endovascular embolization of VA, no neurological deficit
- Abondant VA bleeding, VA trombosis without neurologic deficit
- Both patient were left with unilateral pedicle screw in C2

### – CTA group.....none

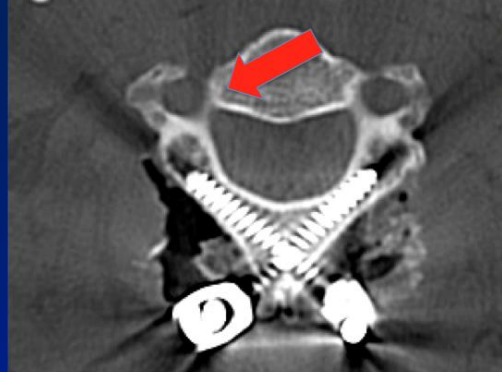
## ✓ Cancelling reasons of pedicle screw in CTA group (8 patients, 25 %)

### – Bilateral translaminar screw

- Thin pedicle .....2 patients
- High riding +Dominant VA.....1 patient
- Variative loops In VA .....1 patient
- Cerebrovascular insufficiency.....1 patient

### – Translaminar+pedicle combined screws

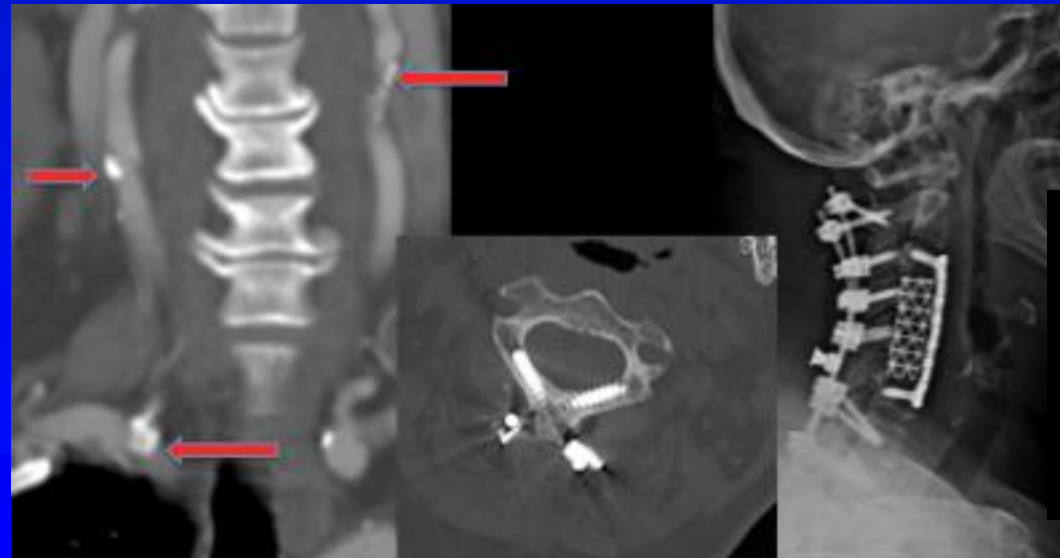
- Variative loop +Dominant VA.....2 patient
- Unilateral high riding VA.....1 patient



**Bilateral translaminar screw  
in patient with THIN PEDICLE**

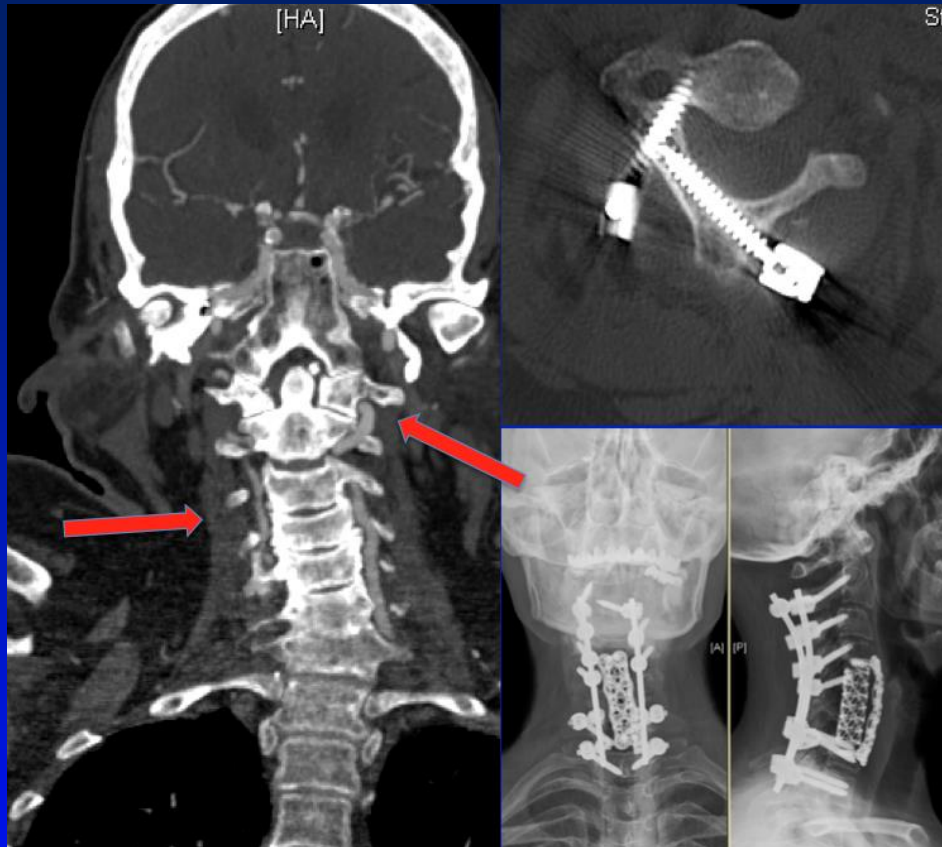


**HIGH RIDING vertebral artery and  
BILATERAL LAMINAR SCREW**



**It is seen calcific plaques in vertebral  
and carotid arteries and this patient has  
severe cerebrovascular circulation  
disorder. Bilateral translaminar screws  
were used in order to prevent dramatic  
results of vertebral artery injury.**





**Left dominant vertebral artery, it is replaced translaminar screw in dominant side in order to avoid vascular injury, and pedicle screw in non dominant side**

# Dominancy of VA

- ✓ **Saving dominant VA is a life threatening issue!**
- ✓ **If the patient has a concurrent VA anomaly and dominant VA (our strategy)**
  - **Bilateral pedicle screw is not recommended as a first choice of axis instrumentation**
  - **Translaminar screw can be used in dominant VA side, pedicle screw in non dominant side**
  - **If you decide for bilateral pedicle screw (not recommended!), start from non-dominant side**
  - **In case of vascular injury in non-dominant side with first screw, absolutely give up second screw to pedicle in dominant side**

# CONCLUSION

- ✓ In patients who do not have contraindications to the use of contrast materials, performing a CTA instead of CT should be preferred for the preoperative assessment of vertebral artery anomalies in posterior cervical fusion.
- ✓ The C2 screw technique may be changed based on this information, and possible vascular complications may be prevented.

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