Radiology for GPs – How I report my foreign workers CXR?

PULMONARY GRANULOMA

Dr Abdul Rahman Mohamad
Consultant Radiologist

R code: R9EA000009
Email: *radiology4gps@gmail.com*

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Regards
Dr Rahman

Criteria 1 – Pulmonary Granuloma

FOMEMA STANDARD REPORTING CRITERIA (FSRC) 2024				
No.	**Abnormality**	**Signs/Appearance**	**Criteria**	**Certification**
1	Pulmonary Granuloma	Any granuloma in any area of the lung	>5mm in diameter	Unsuitable

1. Any granuloma, in any area of the lung, >5mm in diameter is UNSUITABLE.
2. Any granuloma, in any area of the lung, <5mm in diameter or is 5.0mm in diameter, is SUITABLE.

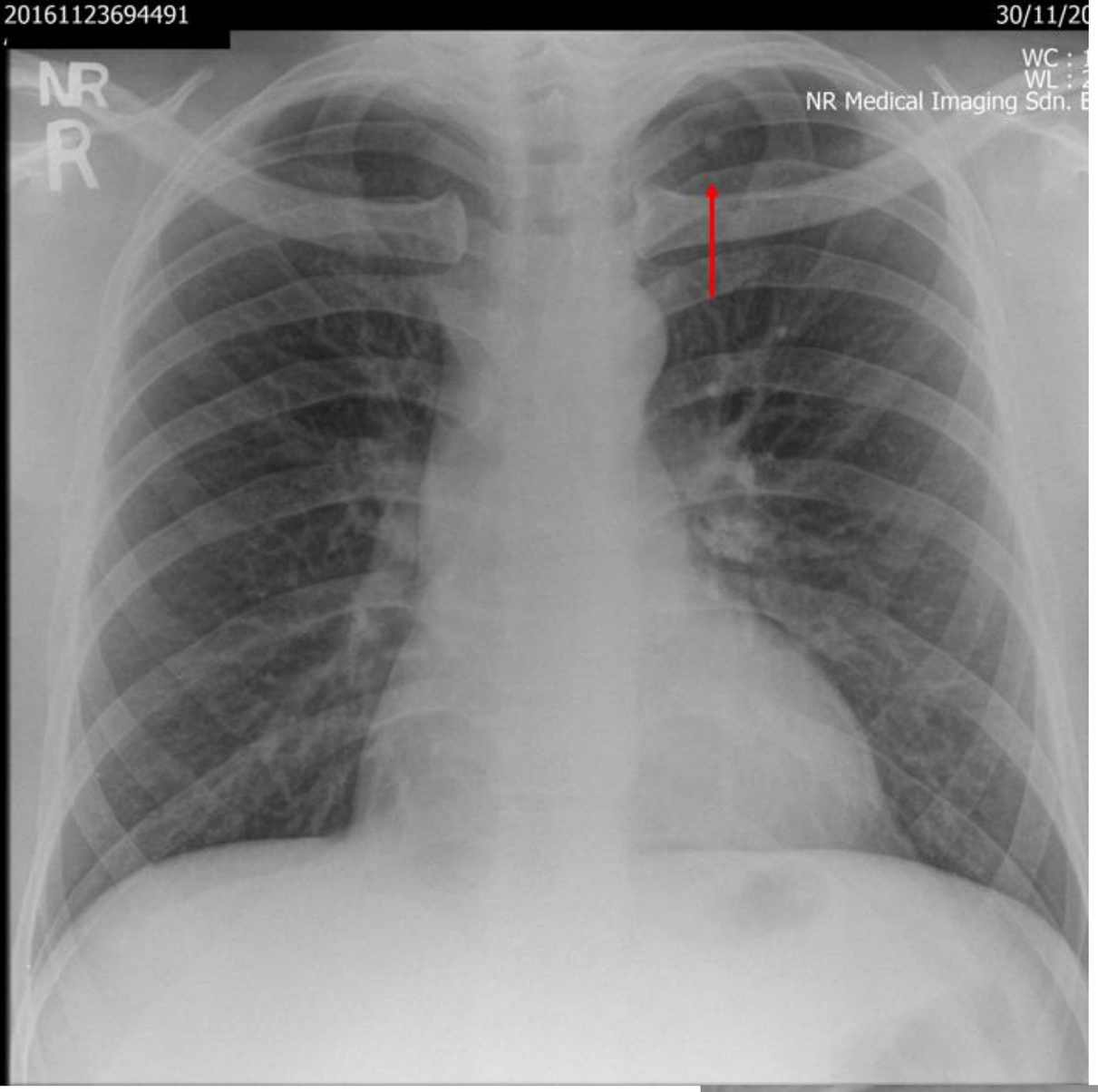
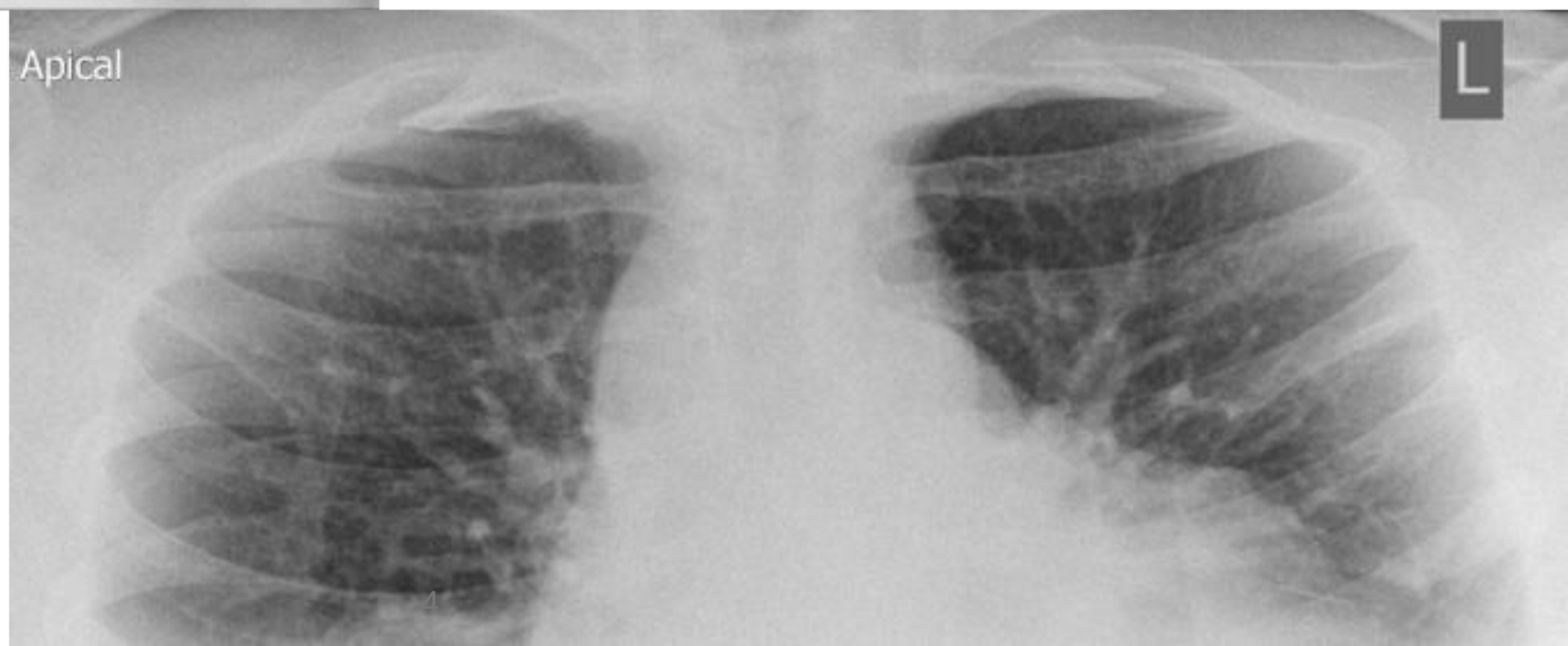


Fig 1.1: On this PA view, there is a nodular lesion in the left upper zone. This lesion looks like a pulmonary granuloma.

Fig 1.2: An apical view was done. There is no more nodular lesion. What was seen on PA view must have been end-on vessel - SUITABLE. Pulmonary granuloma tends to be confused with end-on vessel.

This is the reason why we have a cut-off of 5mm. An end-on vessel is less likely to be more than 5mm.

Consider end-on vessel before calling it granuloma.



Medical Imaging

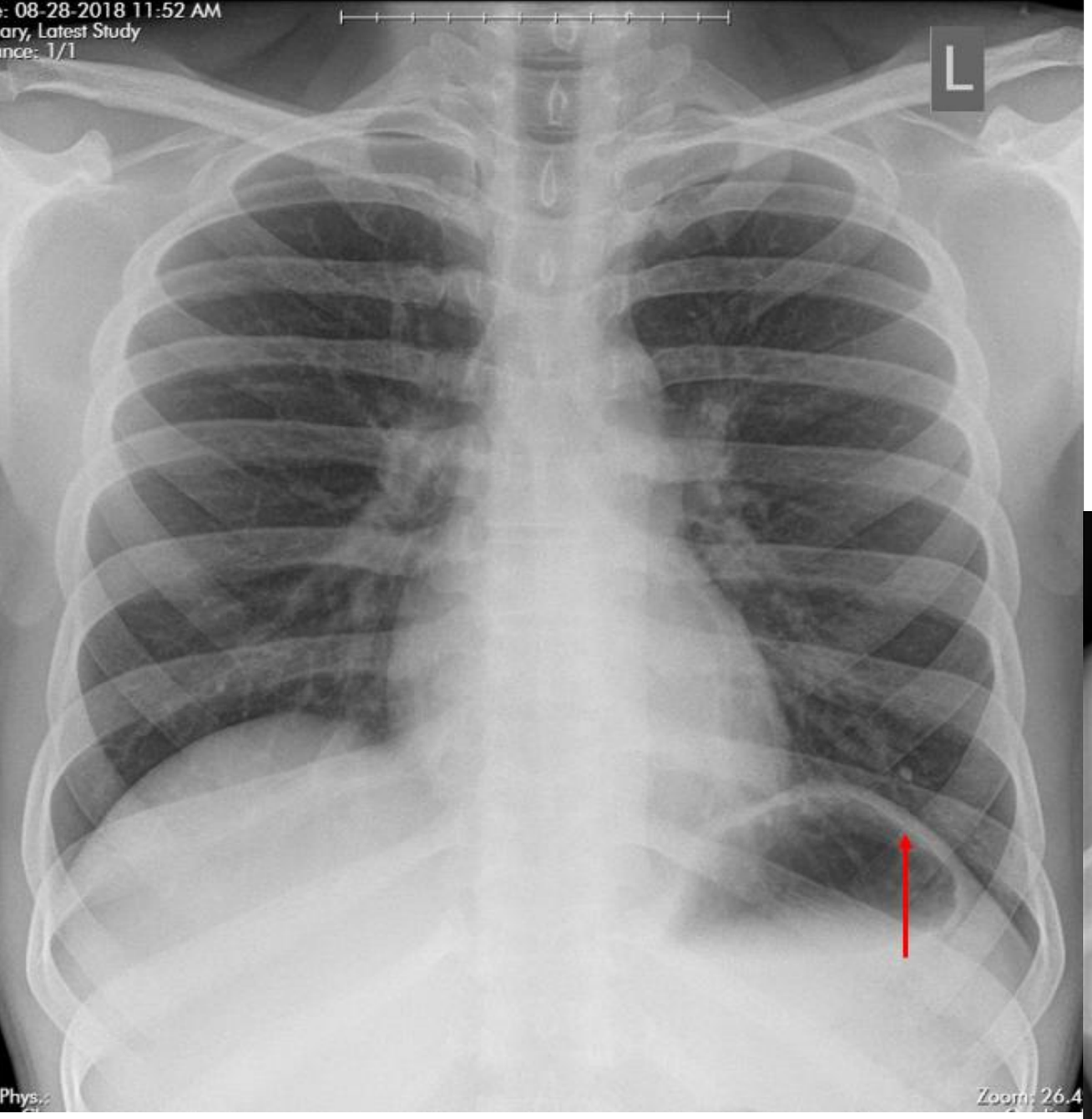


Fig 1.3: PA view showed a nodular lesion at left lower zone. Its quite dense making it convincingly a granuloma.

Fig 1.4: Oblique view of the same person does not show any nodular lesion. The nodule seen on PA view must have been end-on vessel - SUITABLE.

Do extra view to resolve between granuloma and end-on vessel.

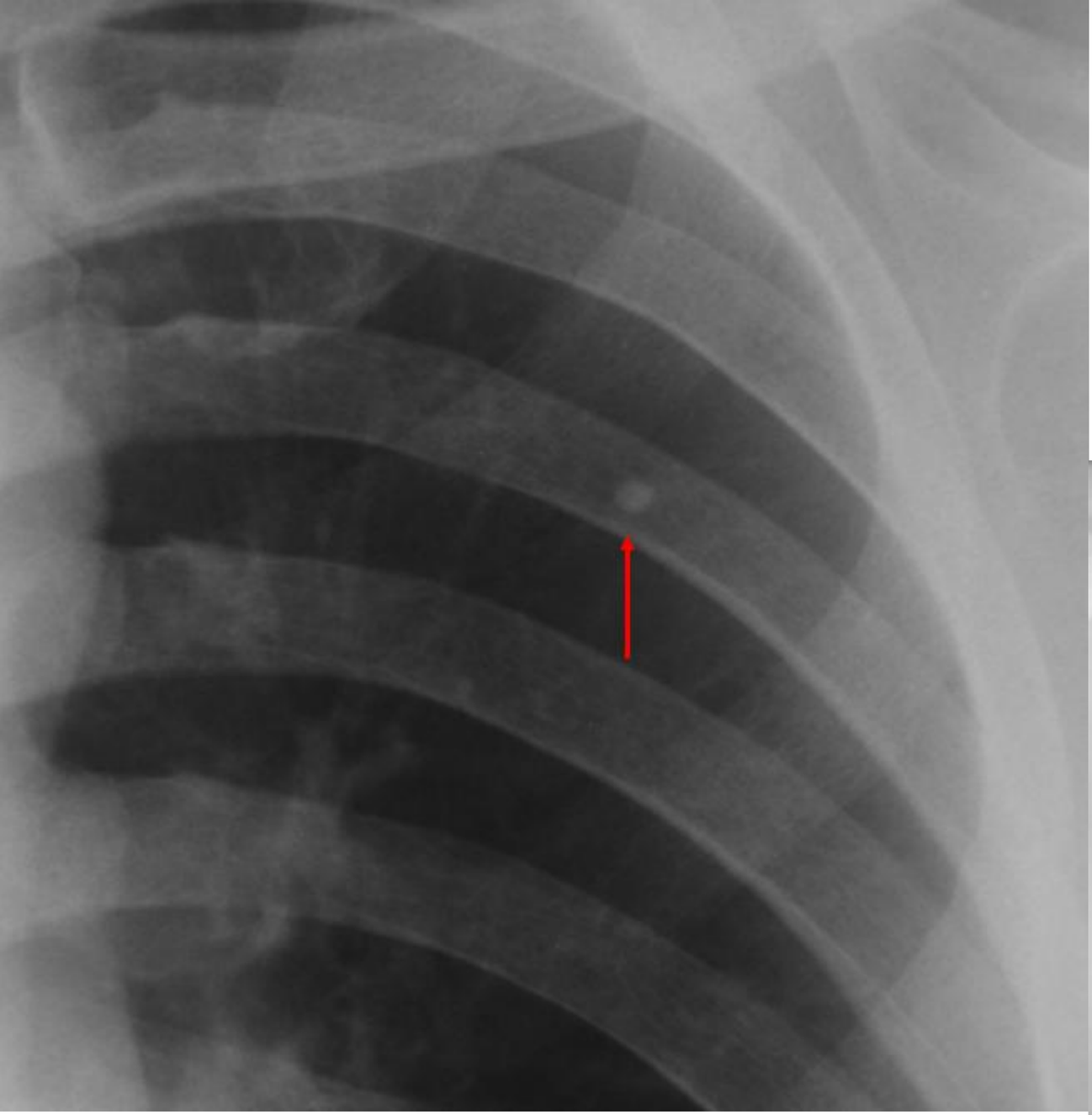


Fig 1.5: A 3mm granuloma in the left upper zone - SUITABLE.

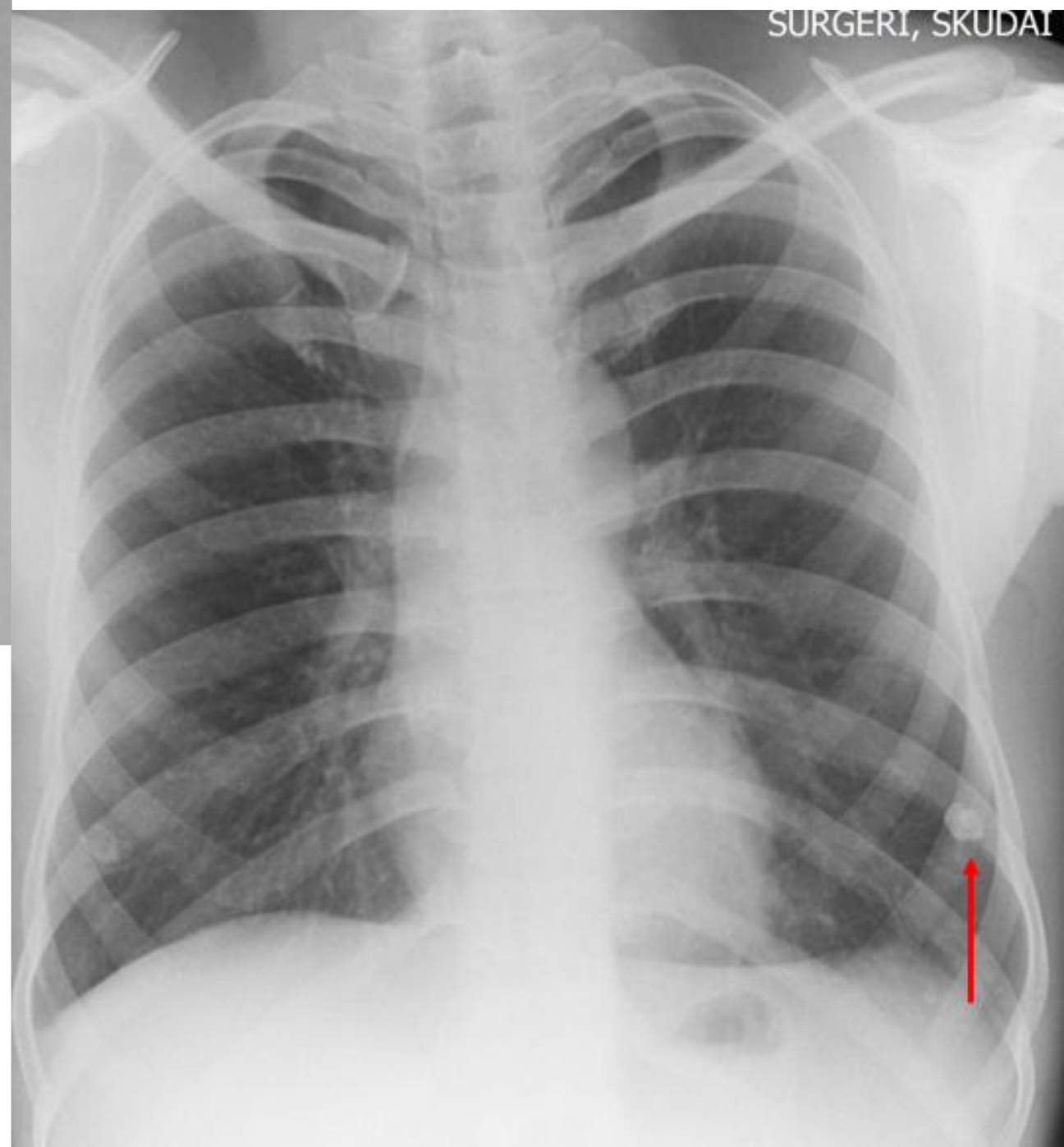


Fig 1.6: An 8mm granuloma in the left lower zone - UNSUITABLE.

If the lesion is exactly 5.0mm, it is SUITABLE. If the lesion is 5.1mm, it is UNSUITABLE.

Cut off for granuloma is 5.0mm.

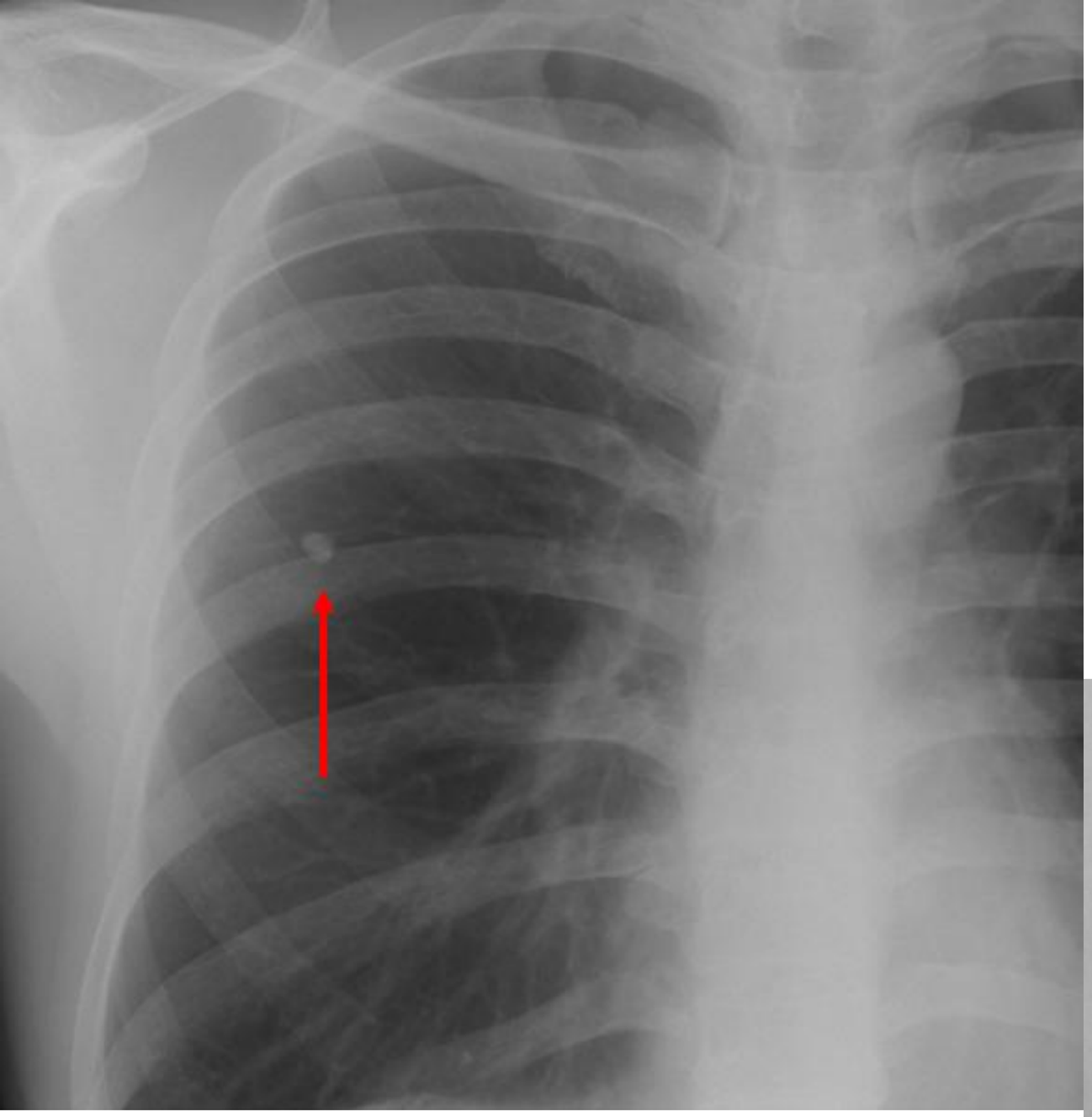


Fig 1.7: A 5.0mm granuloma in the right mid zone - SUITABLE.

Fig 1.8: Same image as above. This is how to measure the size of granuloma. Zoom it first, but don't zoom too much as the margin becomes blurry. This granuloma is oval in shape. Measure along its longest axis.

To measure the size of granuloma, zoom it a bit.

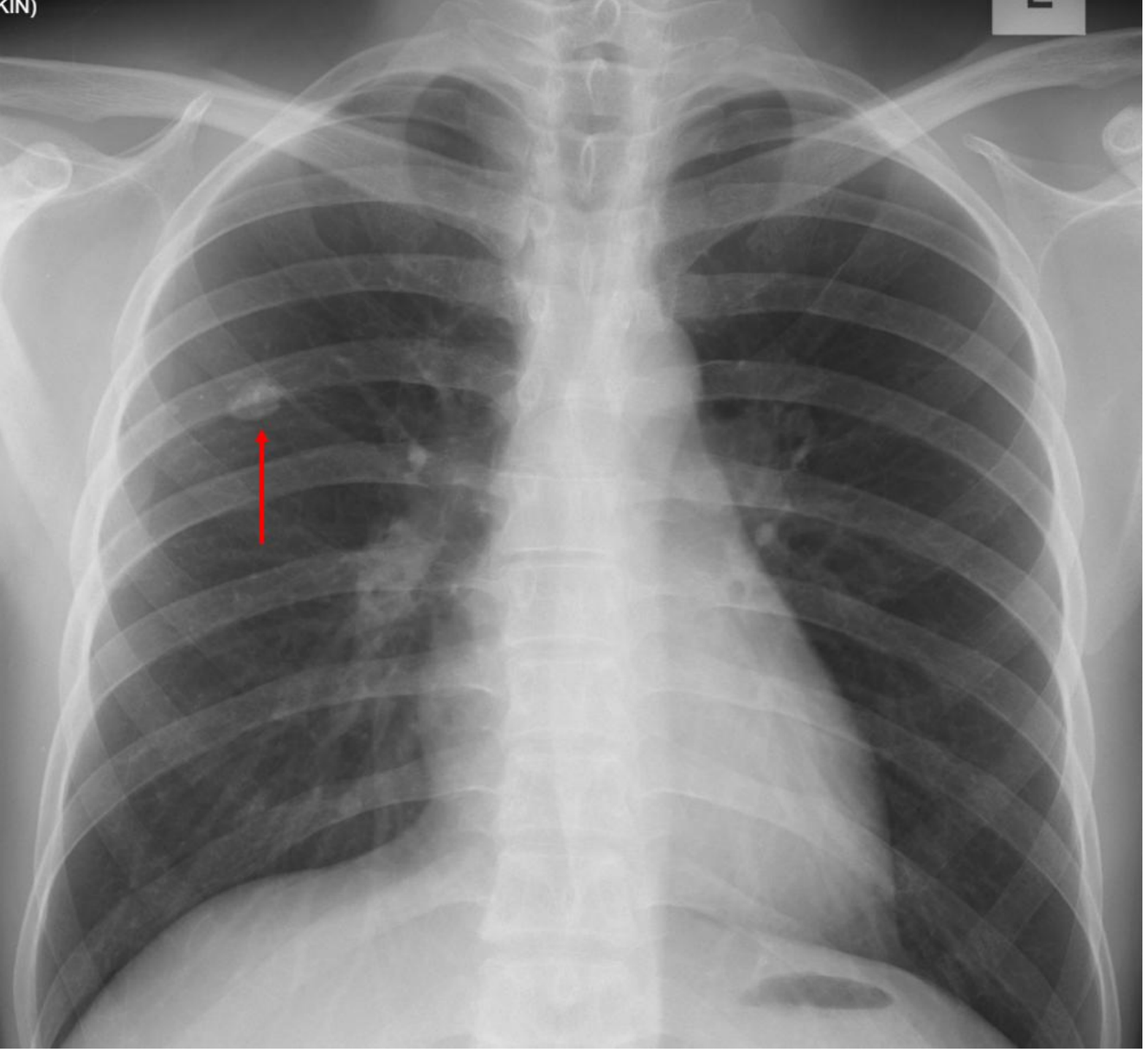


Fig 1.9: A 14mm granuloma in the right mid zone - UNSUITABLE.

What is a granuloma? Granuloma is body reaction to insults. That insults can be infectious (such as mycobacterial, fungal or parasitic) or non-infectious (such as sarcoidosis, rheumatoid arthritis and talc). If it is due to tuberculosis, a better term to use is tuberculous granuloma or tuberculoma. In the context of Fomema, we can take for granted that all granulomas are tuberculous in origin.

Granuloma contains dormant tubercle bacilli. It can rupture and re activate the tuberculosis.

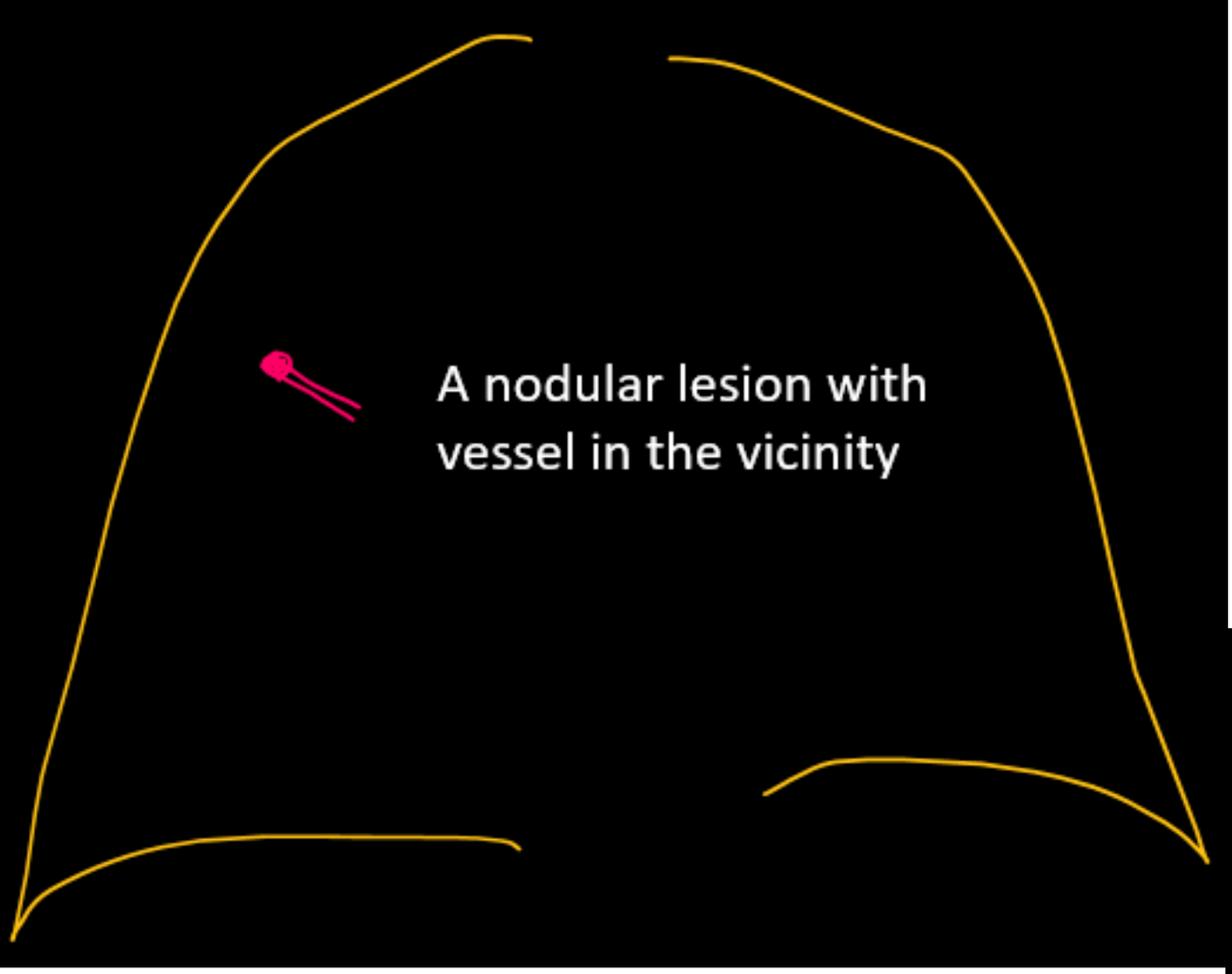


Fig 1.10: How to tell an end-on vessel: An end-on vessel will appear round with a tubular structure going towards it or going away from it. The tubular structure is the vessel as seen longitudinally.

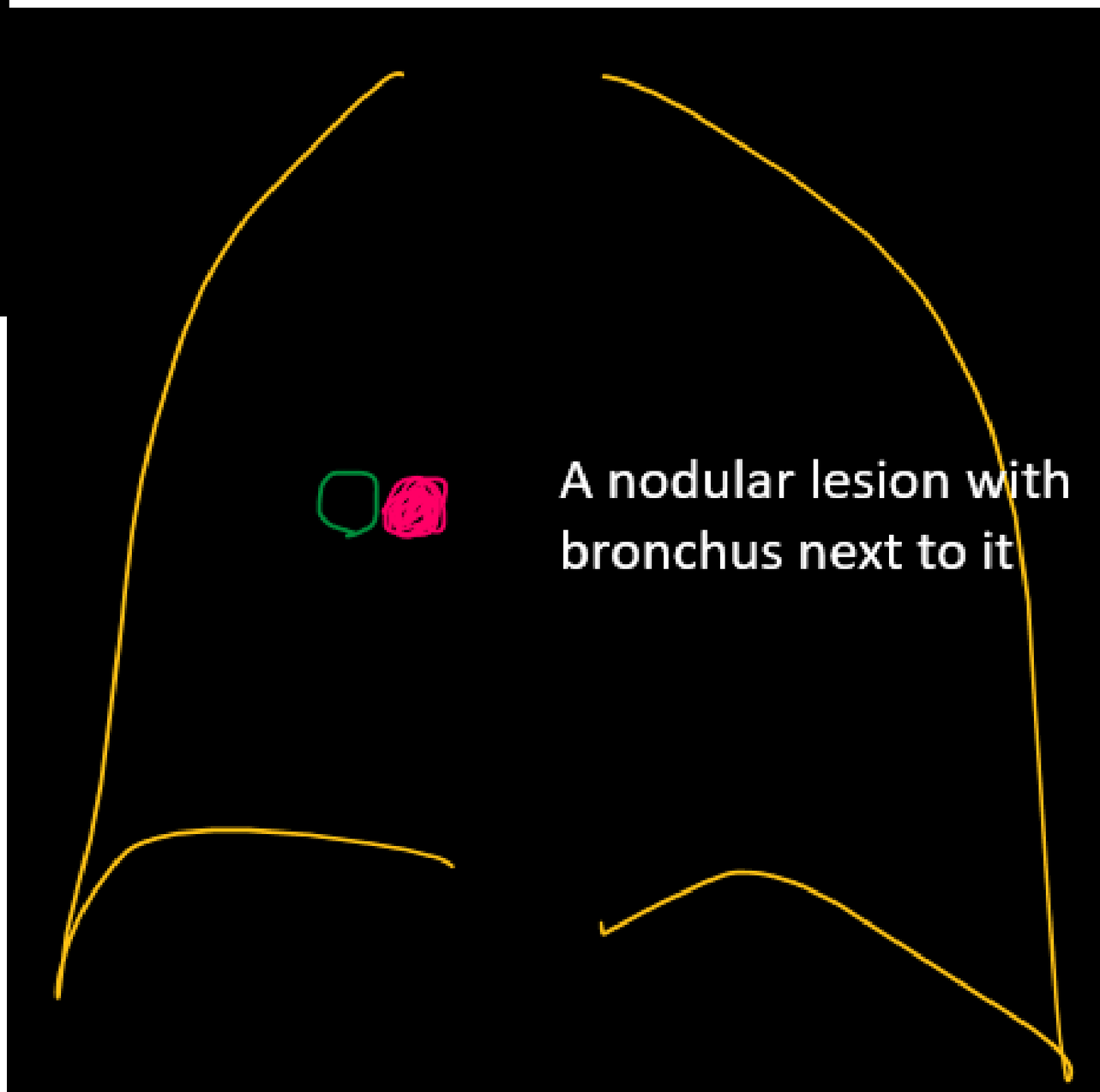


Fig 1.11: How to tell an end-on vessel: An end-on vessel will appear round with a hollow round bronchus next to it. Blood vessel and bronchus leaves the hilum together all the way to the periphery.

End on vessel will have a vessel shadow adjacent to it. It will also have bronchus next to it.

Fig 1.12: How to tell a granuloma: A granuloma appears round or oval on PA view. It can be anywhere but are more often seen in the periphery of the lungs.

Other features to make it more likely granuloma are there is no nearby vessel or bronchus, it can be calcified, sizes can range from a few mm to 4cm and it should be seen in 2 views.

Fig 1.13: How to tell a granuloma: If you were to do another view eg lateral or oblique, it will still appear round or oval.

Granuloma has distinctive appearance. If still unsure, do another view.

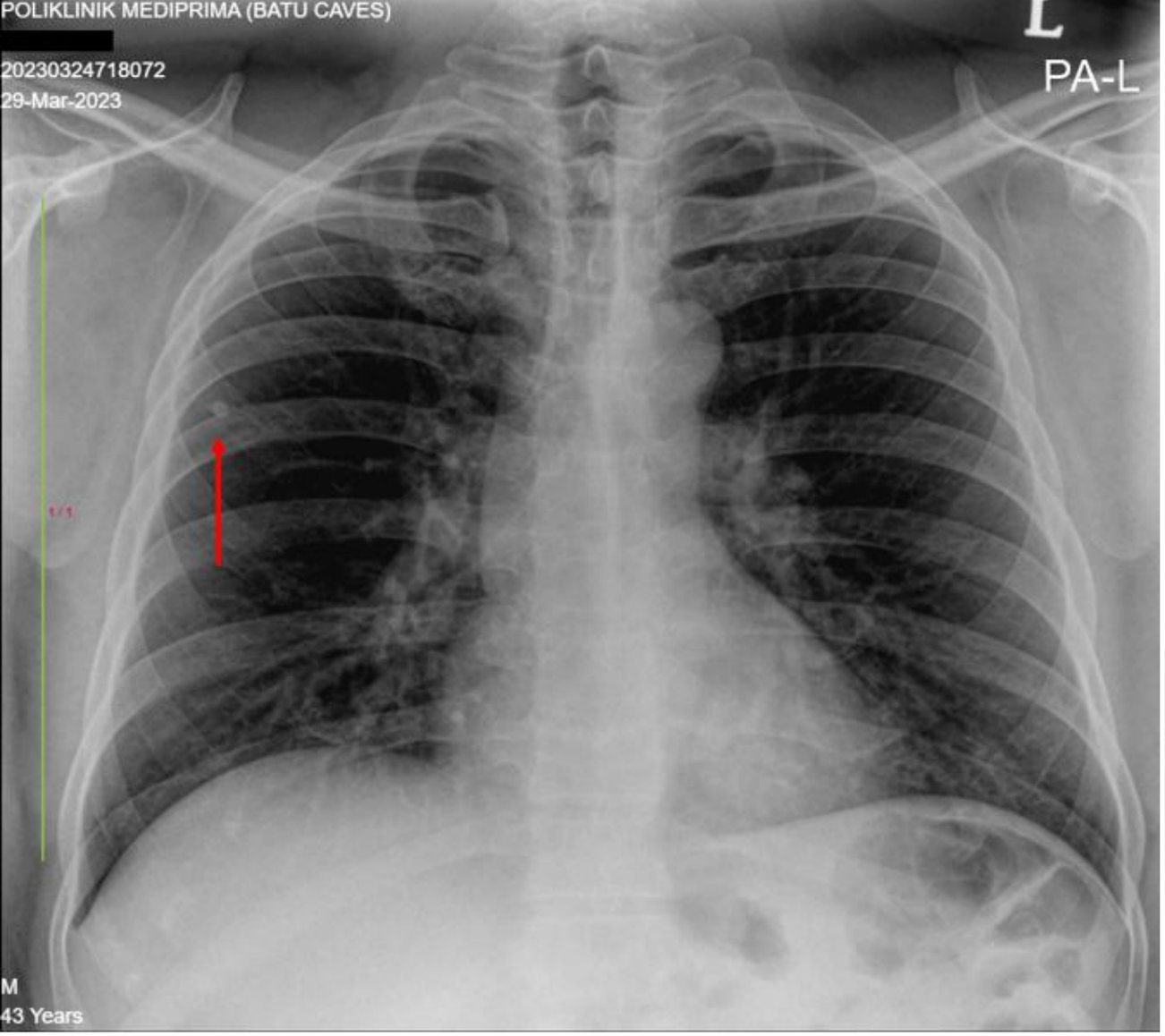


Fig 1.14: A single pulmonary granuloma in the right mid zone.

Tuberculous granuloma is usually single but can be multiple. It tends to be oval in shape. Some may calcify. If multiple, they are of varying sizes and shape.

It can be associated with other lung findings such as pulmonary or pleural fibrosis.

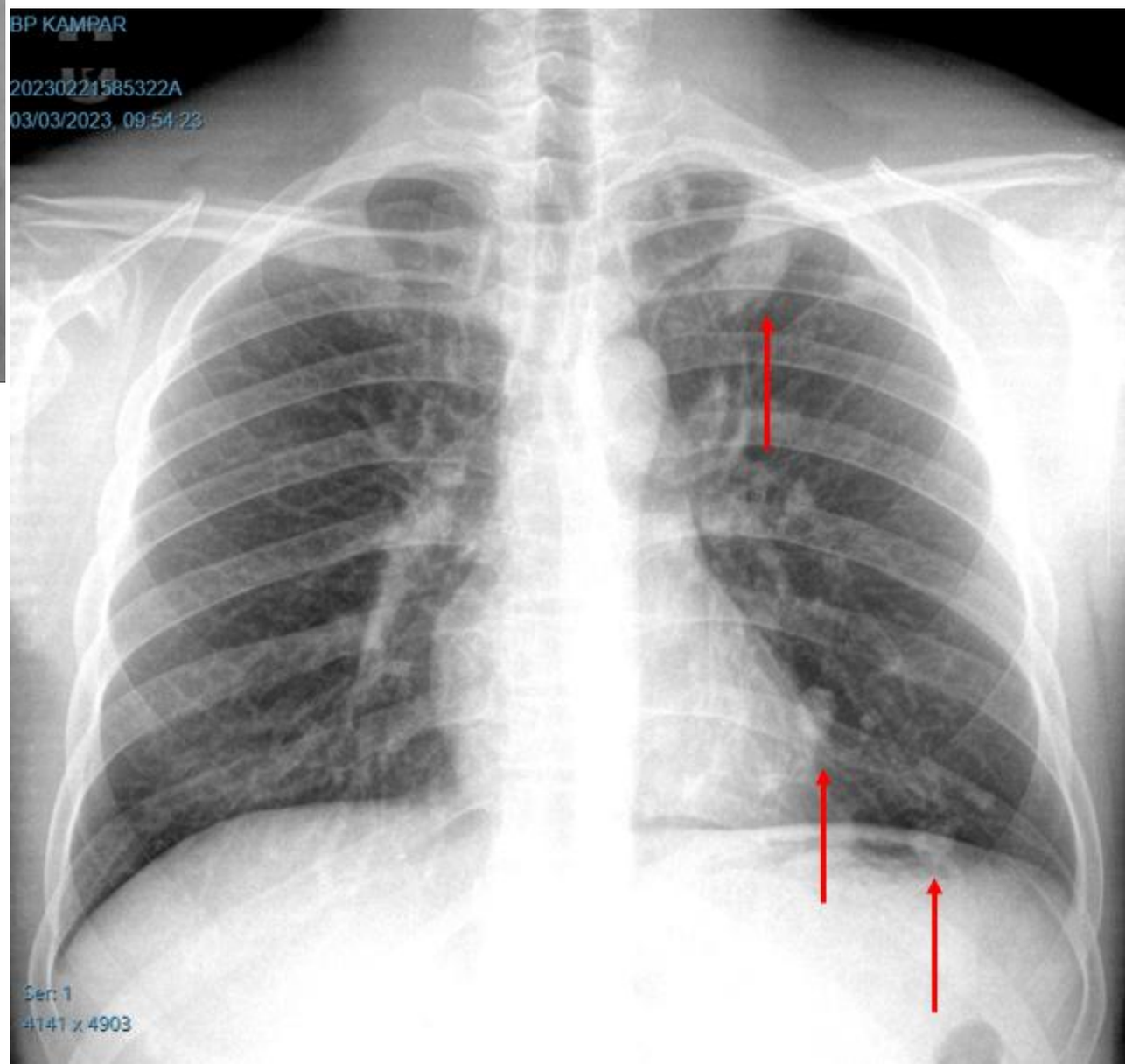


Fig 1.15: Multiple pulmonary granulomas of varying sizes in the left lung field.

Granuloma can be single or multiple and can have varying sizes and shapes.

Fig 1.16: 52F, PMH pulmonary TB. CXR showing multiple pulmonary granulomas of varying sizes in both lung field. Bilateral apical fibrosis also present.

Fig 1.17: 2-3mm soft nodular opacities scattered over both lung fields. This is miliary TB.

Miliary TB presents as multiple nodules scattered over both lung fields. They never present as single nodule because the basis of spread is hematogenous. Each nodule is about 2-3mm in diameter and uniform. They are soft in density.

As opposed to granuloma, miliary TB have a more uniform size and widespread in distribution.

Fig 1.18: 1-2mm high-density calcified micronodules scattered over both lung fields. These re calcified nodules from varicella pneumonia.

Varicella pneumonia may heal with granuloma formation. These granulomas tend to be much smaller and 1-2mm in diameter scattered over both lung fields. As opposed to miliary nodules, they are high-density calcified micronodules.

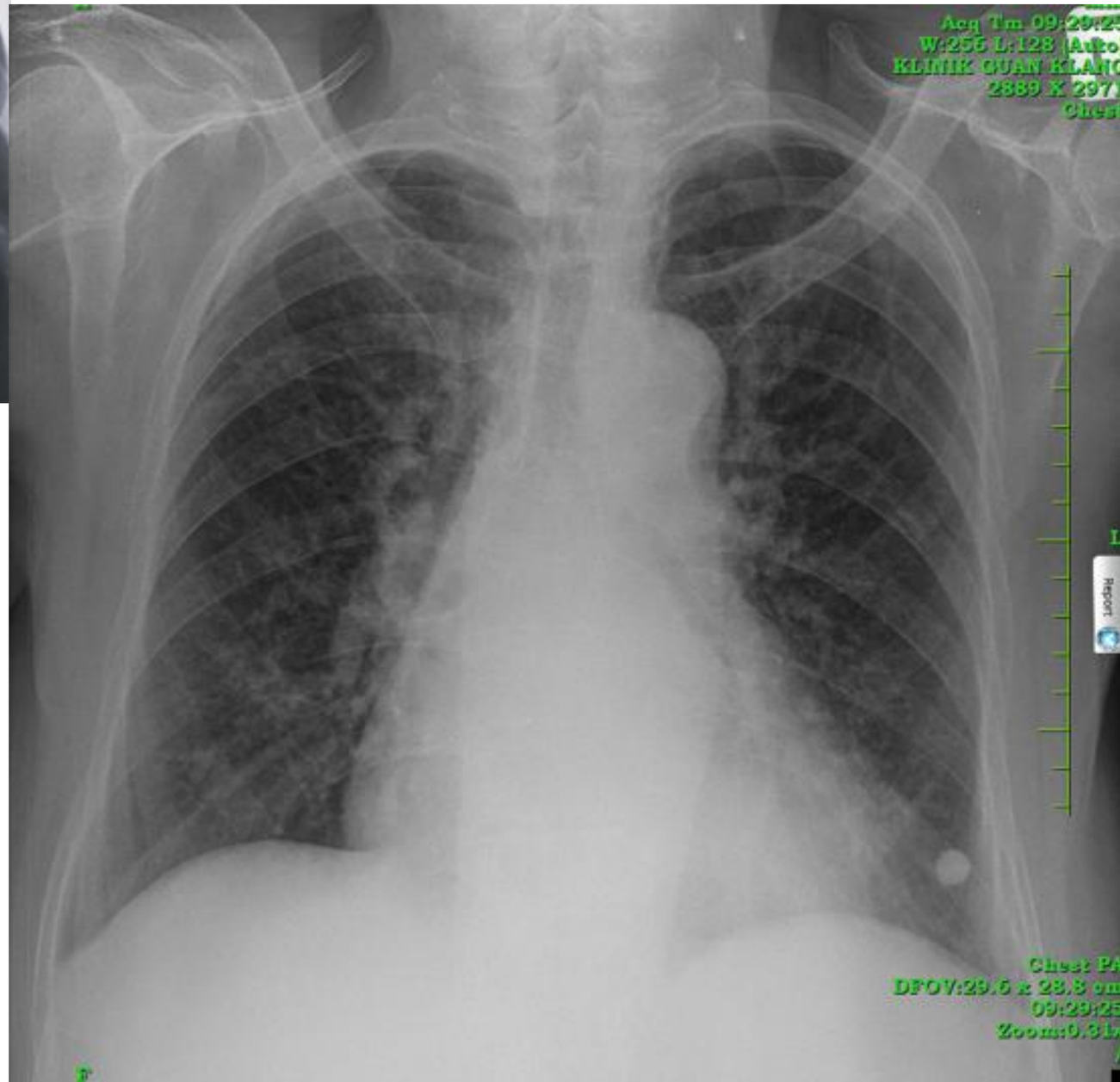


Fig 1.19: 9mm heavily calcified nodule left lower zone. This is calcified pulmonary granuloma.

Some granulomas may ossify and some are not.

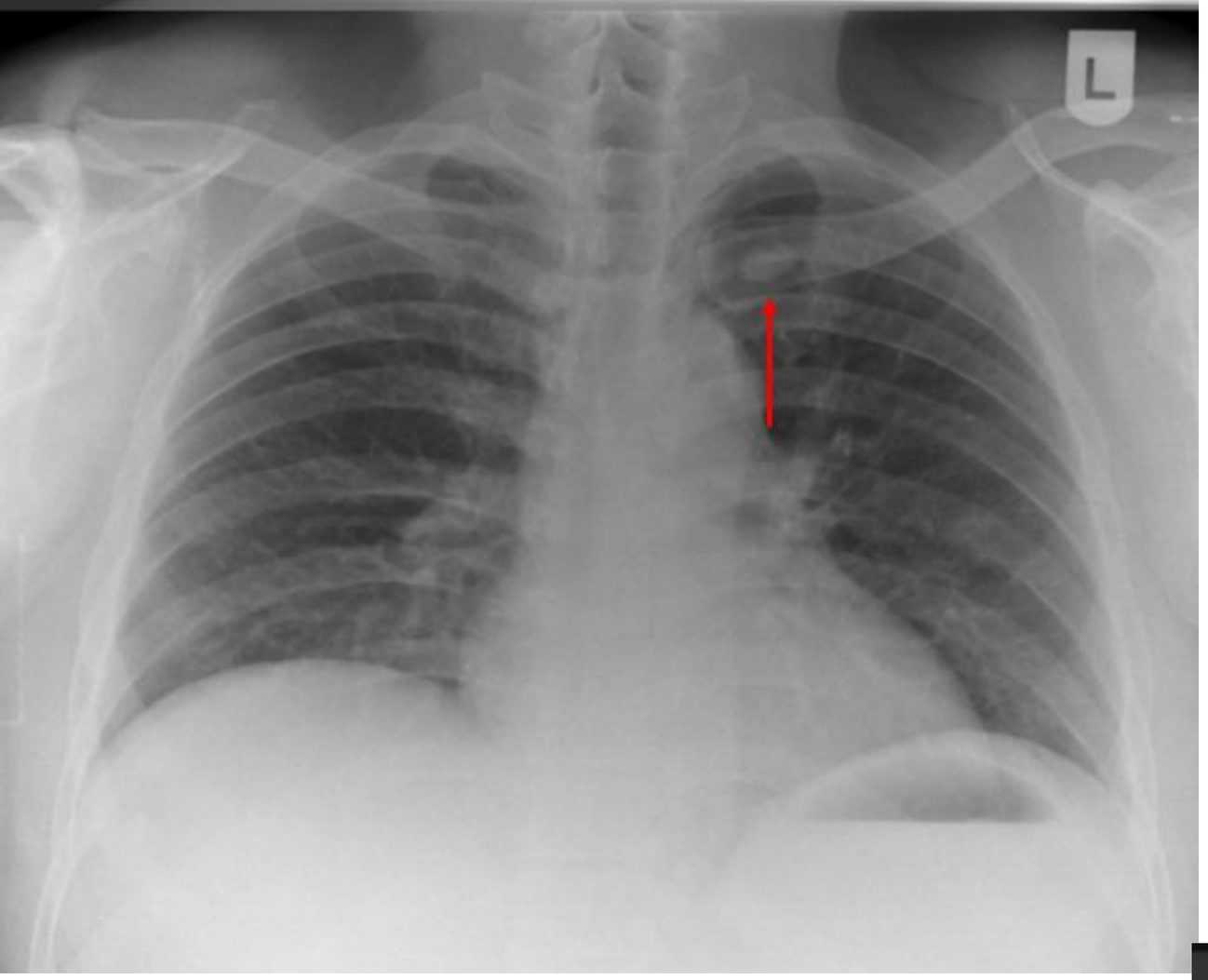


Fig 1.20: PA view showing a 10mm oval nodular opacity in left upper zone. This could easily be passed of as a granuloma.

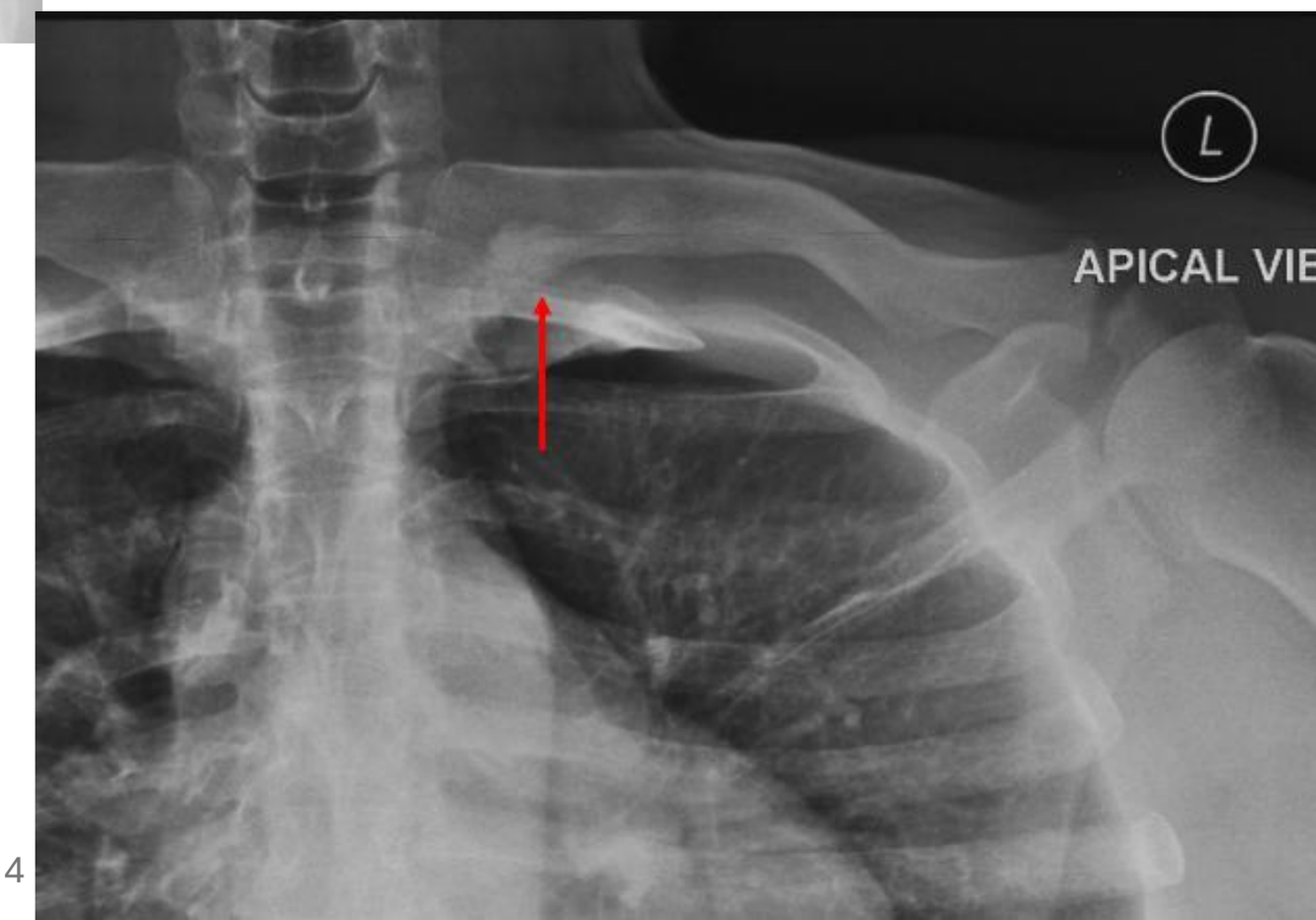


Fig 1.21: Apical view shows that the lesion is on the clavicle. This is a bone island - SUITABLE.

Be fair to the worker by properly investigating it out. We do not want to send back ‘bone island’!

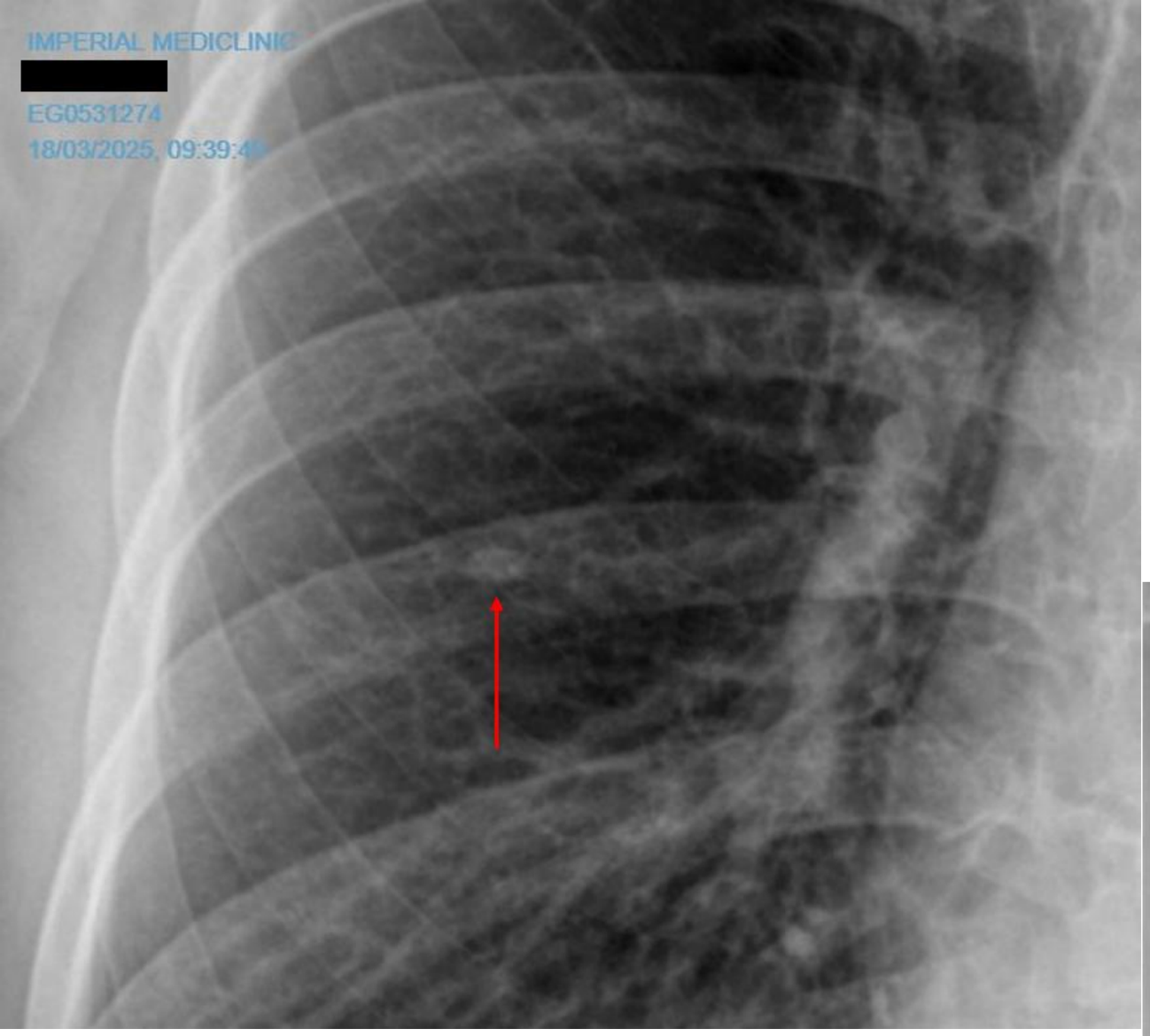


Fig 1.22: PA view showing 7mm oval nodular lesion overlying right 7th rib. This could be a granuloma or bone island.

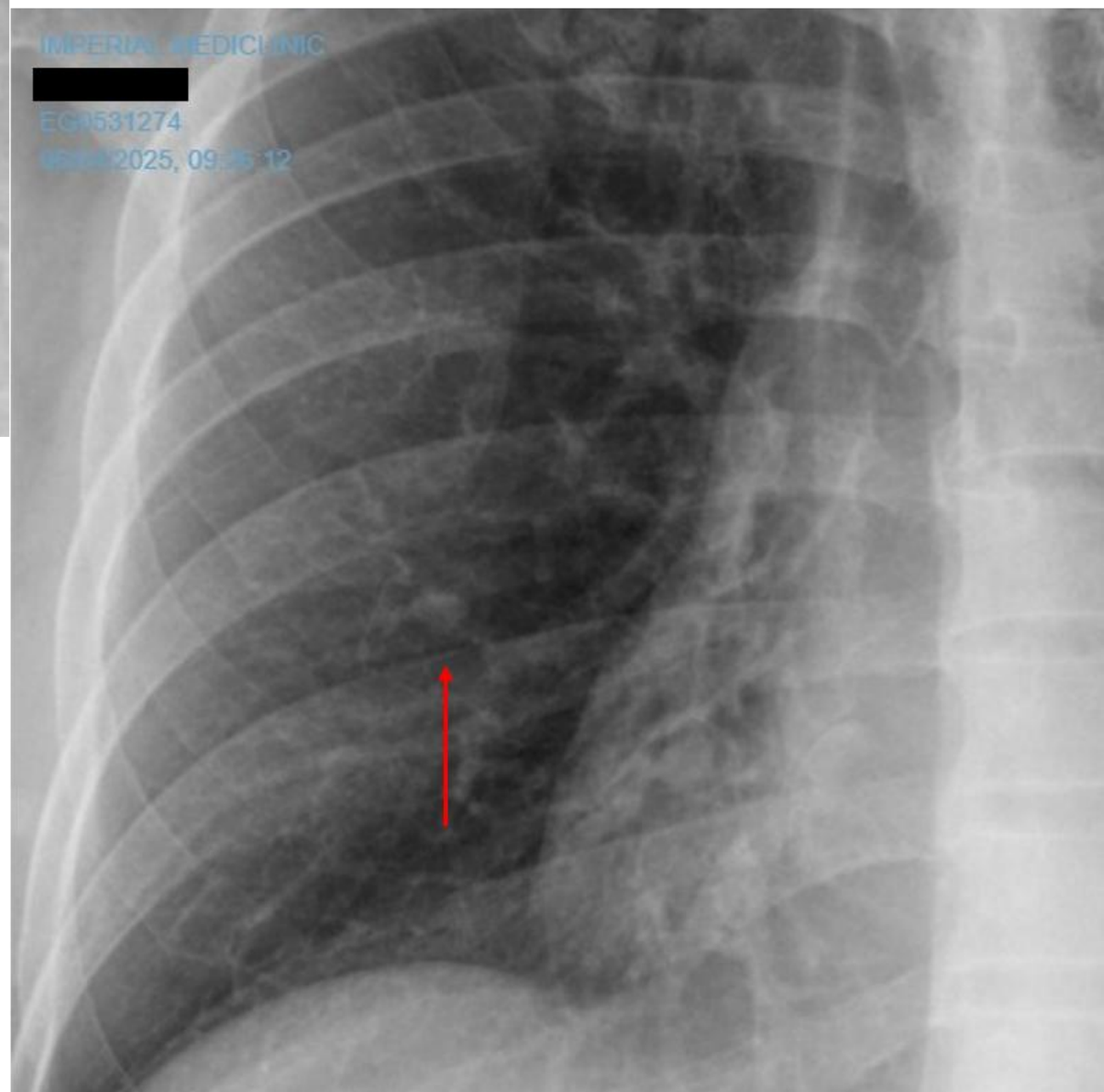


Fig 1.23: Oblique view of same patient showing the nodule is not over 7th rib anymore. This indicates that the nodule is a granuloma and not a bone island - UNSUITABLE.

Don’t be too confident to say bone island. Do another view to be sure.

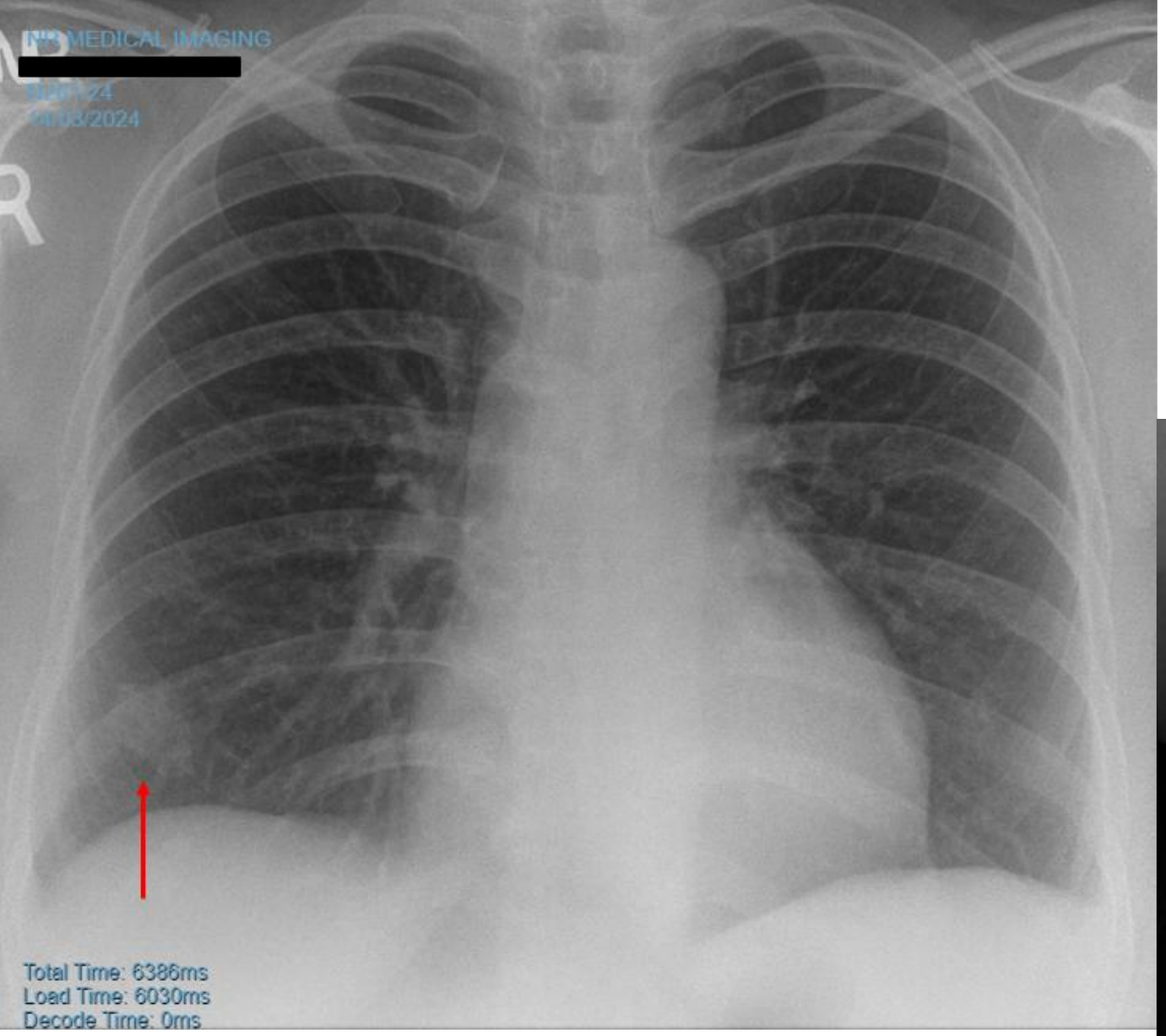


Fig 1.24: PA showing a large nodular lesion at right lower zone.

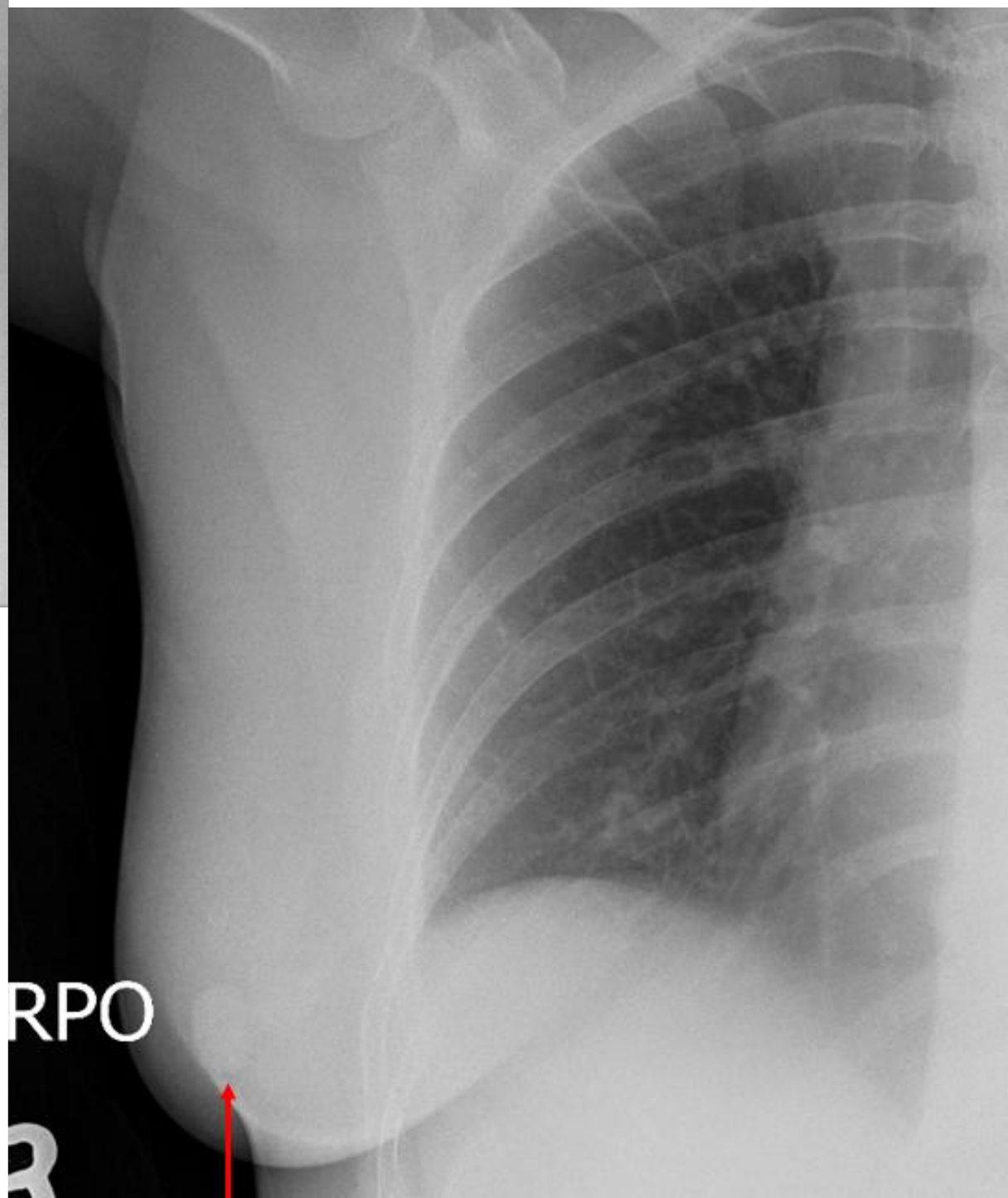


Fig 1.25: RPO view of the same patient showing nipple shadow. Nipple is obviously, SUITABLE.

Nipple is usually located in the lower zones and in the 5th intercoastal space. It measures about 1 – 1.5cm in diameter.

If you are uncertain, repeat PA view with nipple marker.

Nipple is a great mimicker!

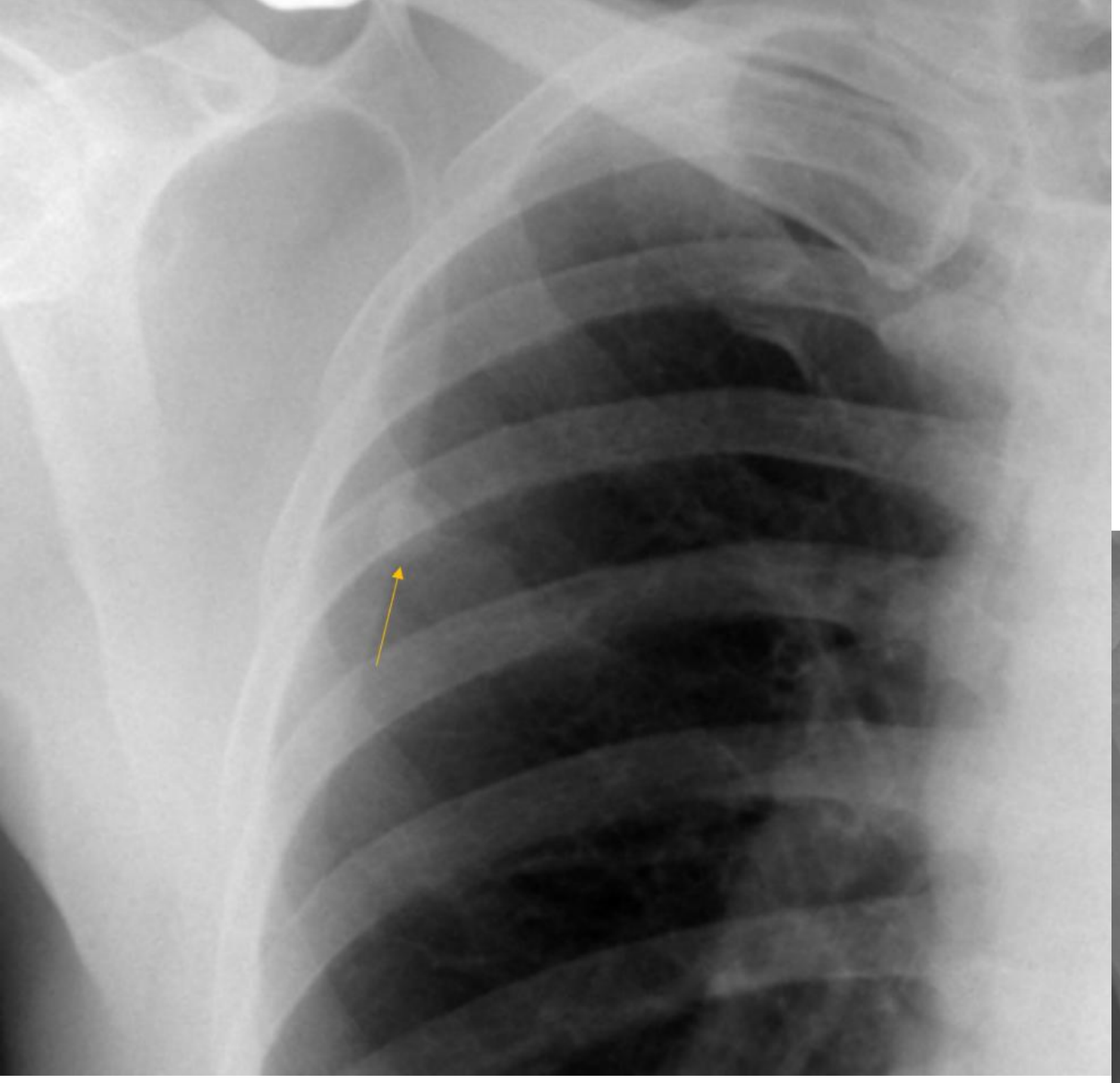


Fig 1.26: A large nodular lesion is seen overlying right 3rd rib. It looks just like any granuloma.

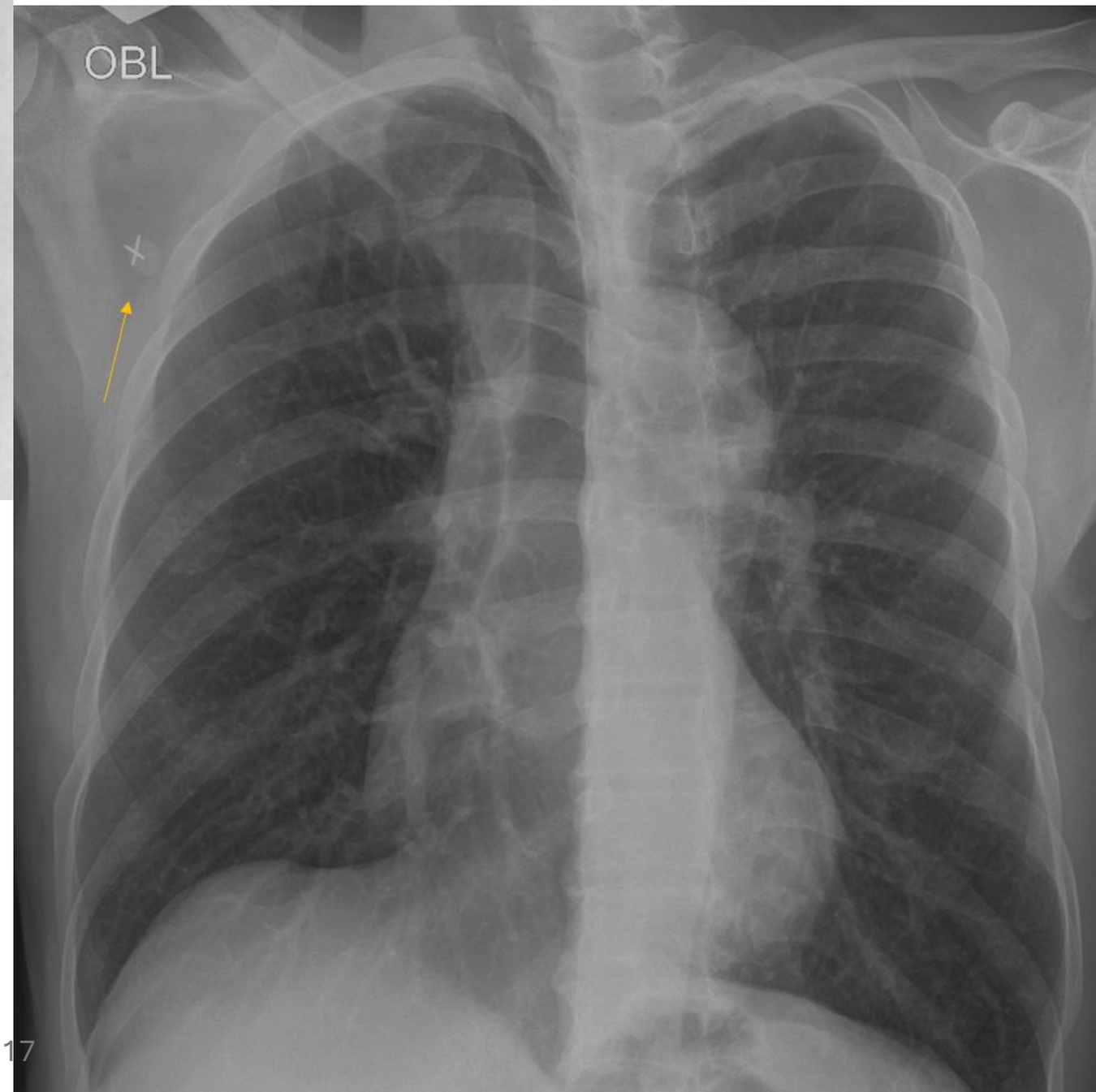


Fig 1.27: RPO view of the same patient with marker on the wart. The lesion is not in the lung field anymore. This is a wart on the patient's back and SUITABLE.

A wart on patient's back can be seen within the lung field on PA view.

Radiographer needs to be observant and make a note of this.

Best if he could annotate on the image so that when the image gets audited, there is no confusion about it.

Radiographer needs to be alert to things on the patient's body that may be seen on a chest x-ray.

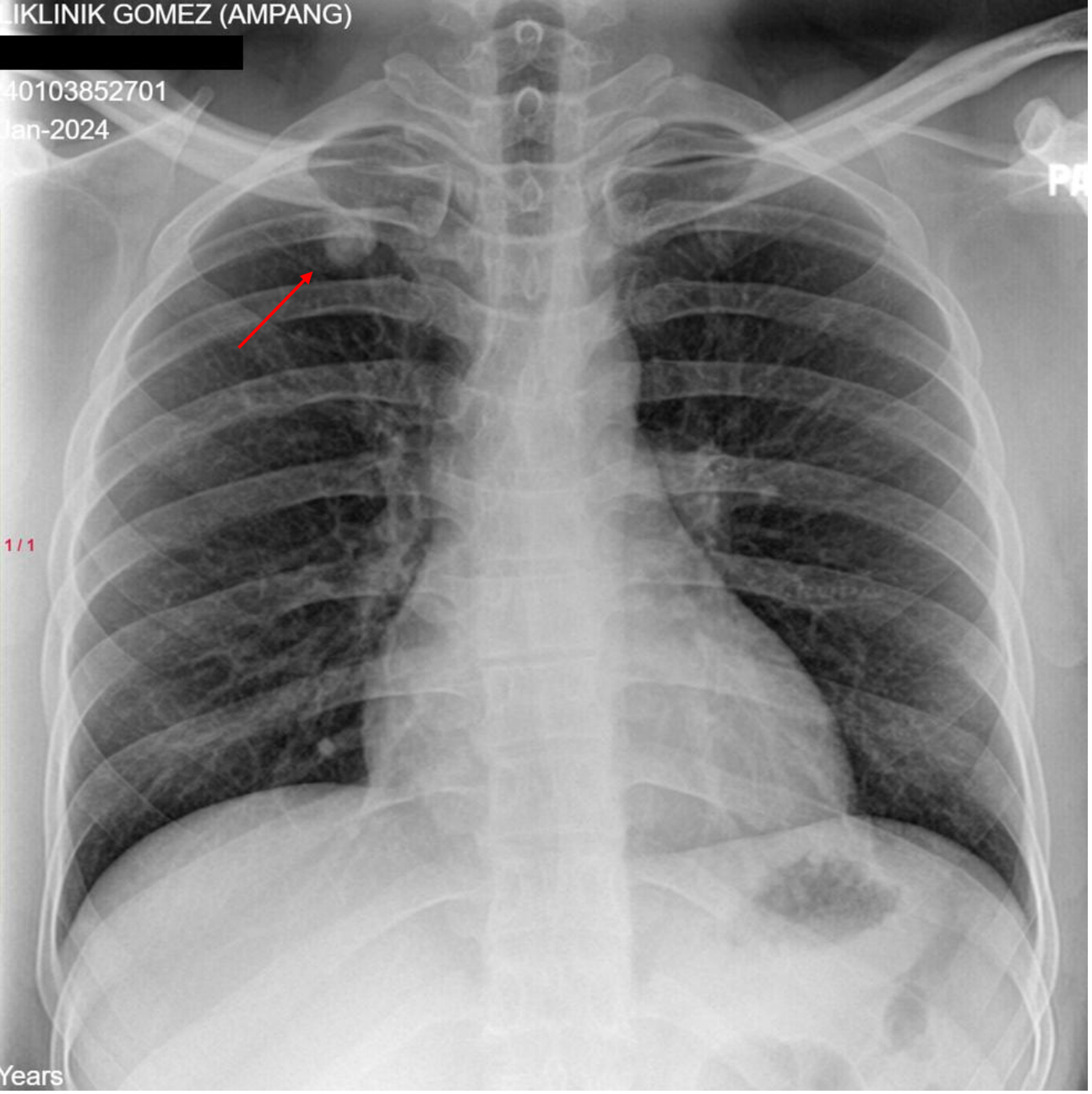


Fig 1.28: There is a large nodular lesion in the right upper zone. This is ossified end of right 1st rib - SUITABLE.

Ribs are made of 2 components – bone and cartilage.

The cartilage component of 1st rib tends to ossify. Ossification pattern varies between individuals and between the right and left. This ossified cartilage can mimic a granuloma.

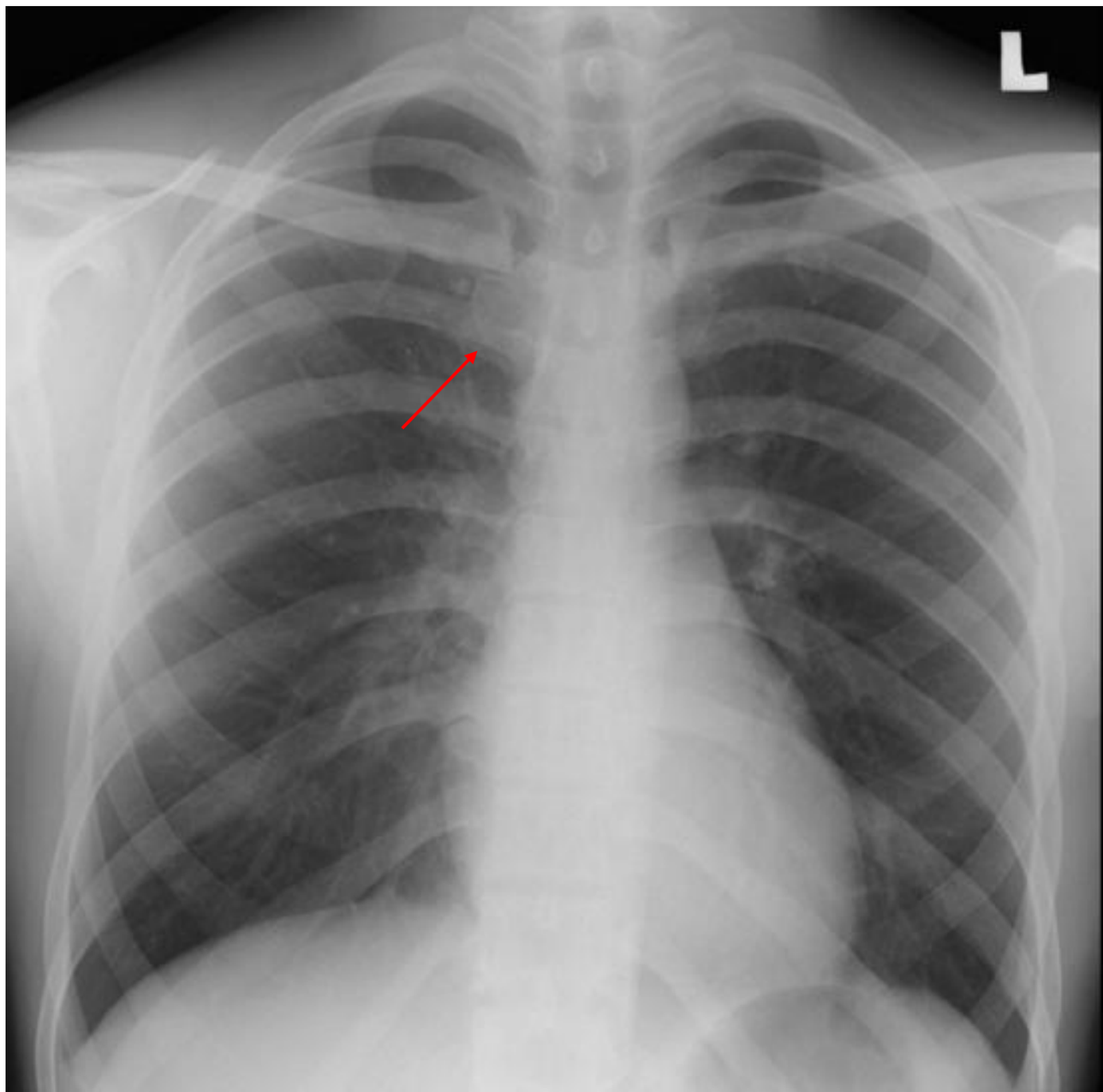


Fig 1.29: Is this a granuloma?

No. In that location, it is also an ossified cartilage of the 1st rib.

Ossified cartilage of the 1st rib may mimic granuloma.

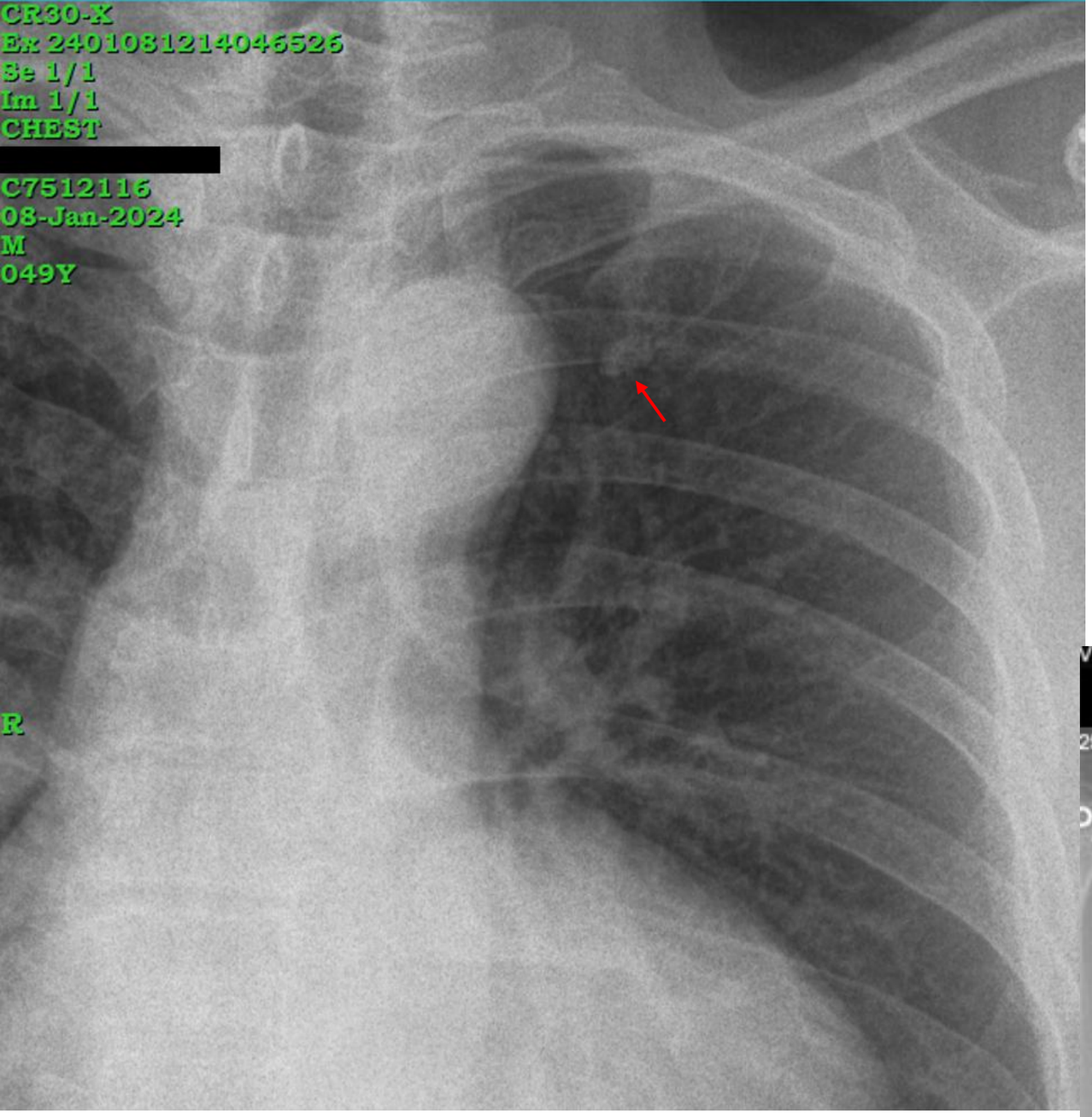


Fig 1.30: There is an oval-shaped nodular lesion in the left upper zone. This is ossified end of left 1st rib - SUITABLE.

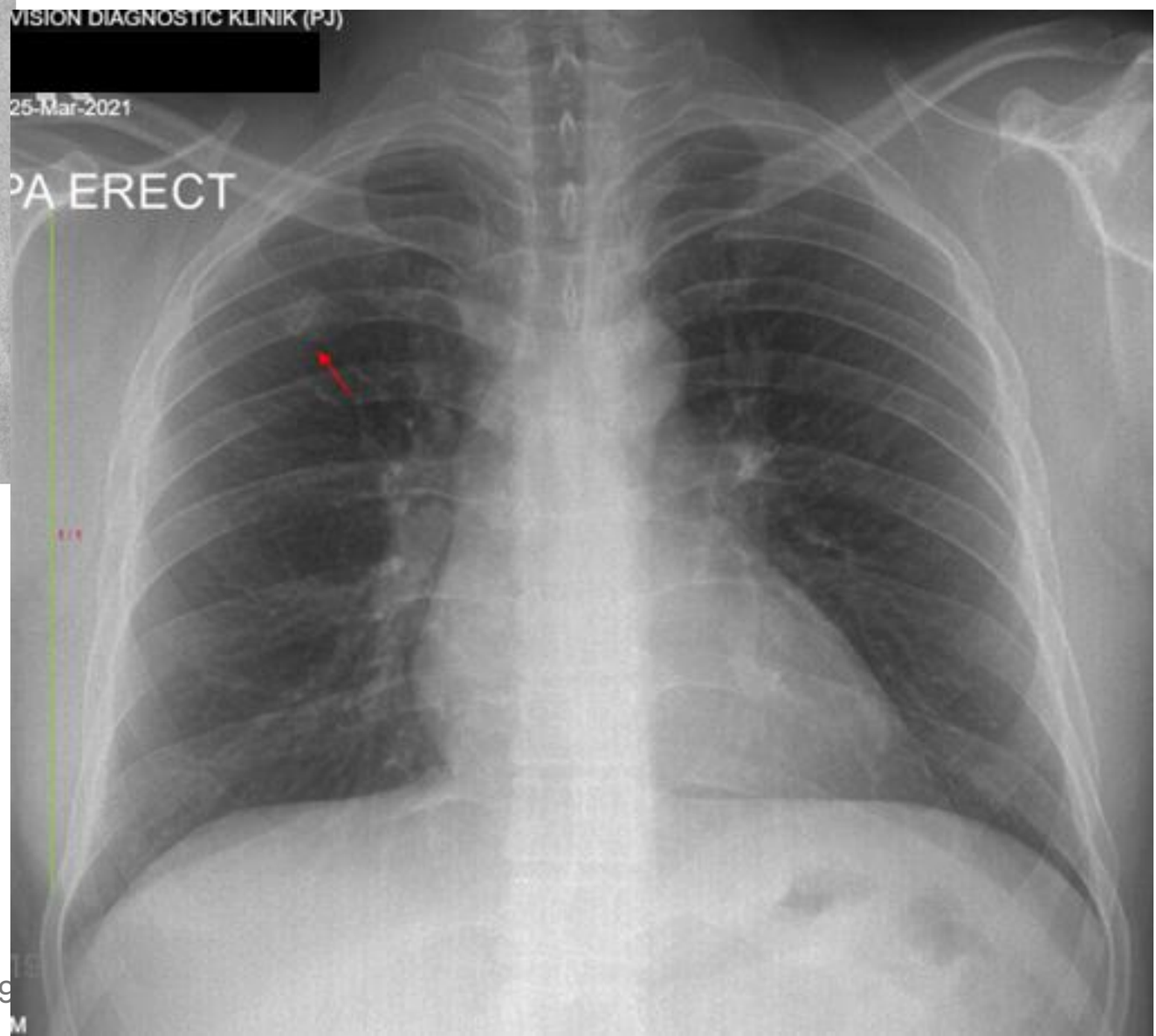


Fig 1.31: Ossified coastal cartilage of the 2nd rib - SUITABLE.

Ossified cartilage can be of any ribs, not just the 1st rib.

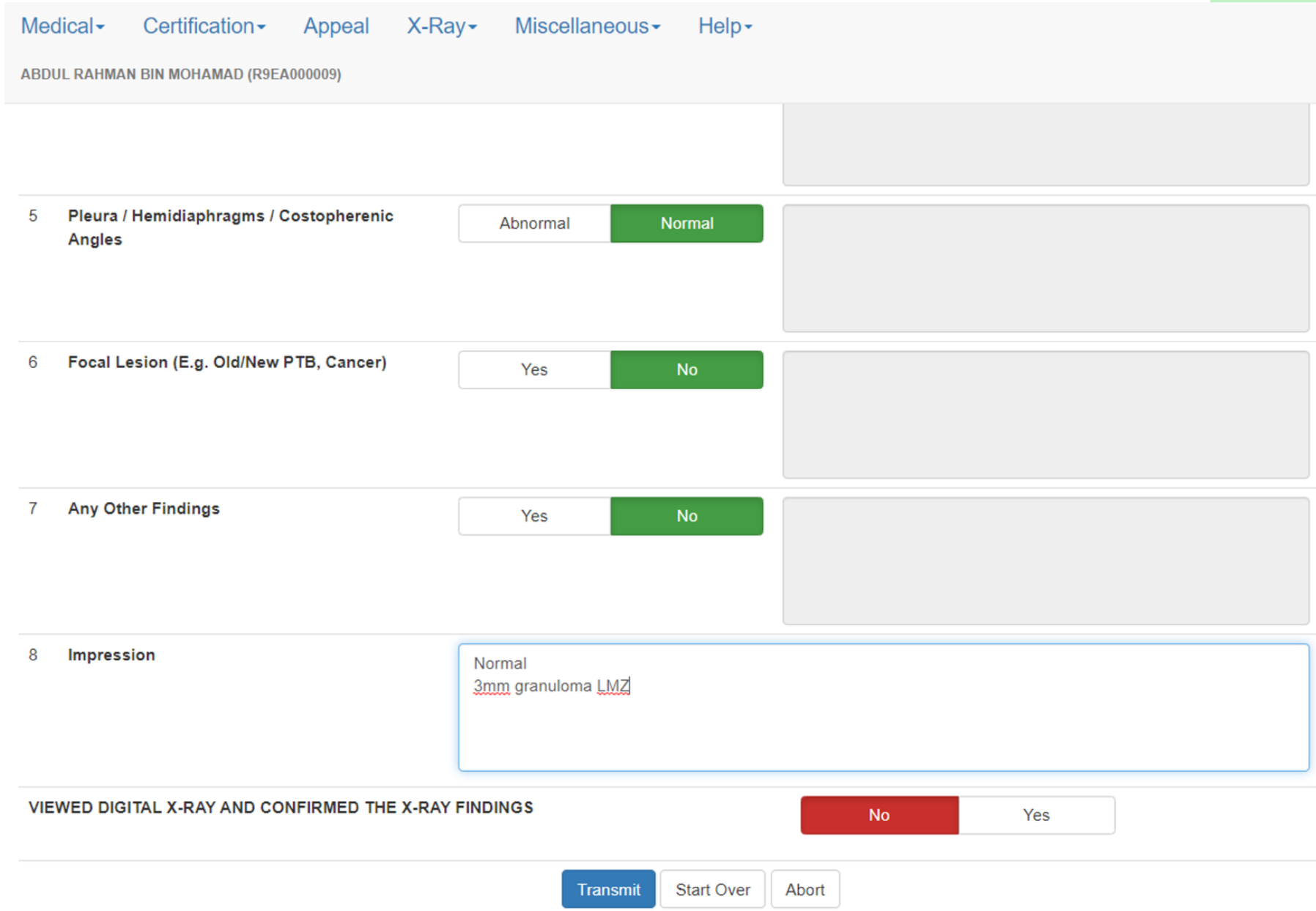
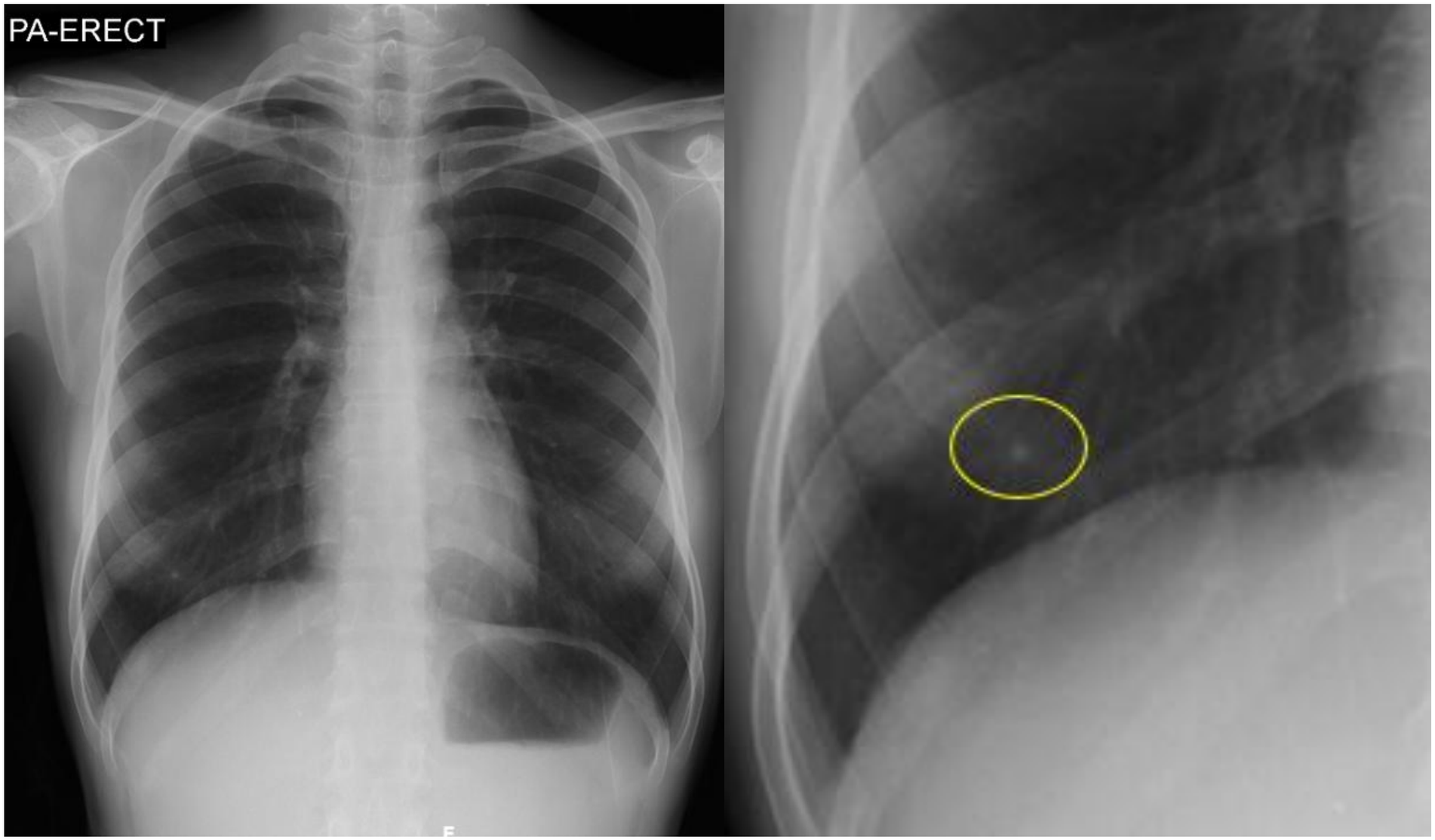


Fig 1.32: If there is a granuloma and the size is within suitable limit, how to do write on the report form?

First of all, don't click any of the abnormal column.
The form is pre-populated with the word NORMAL in the impression column. Leave it as it is and then mention the pathology, size and location under the word normal.
As an example, if there is a 3mm granuloma at left mid one, then write 3mm granuloma LMZ.

If you click any of the abnormal column, the case becomes UNSUITABLE.



Lung Fields	Abnormal	Normal

SMALL 4.5MM NODULE IN THE RIGHT LOWER ZONE. THIS COULD BE A GRANULOMA OR END ON VESSEL. OBLIQUE MAY BE HELPFUL.

Fig 1.33: What is wrong with this report?

The doctor is correct in pointing out that this nodule could be a granuloma or end on vessel. However, as the size is <5mm, there is no necessity to characterise it further. He can just report this as normal.
In my opinion, this is just end on vessel.

Learn the reporting criteria. The above doctor has delayed the examination process due to his ignorance.

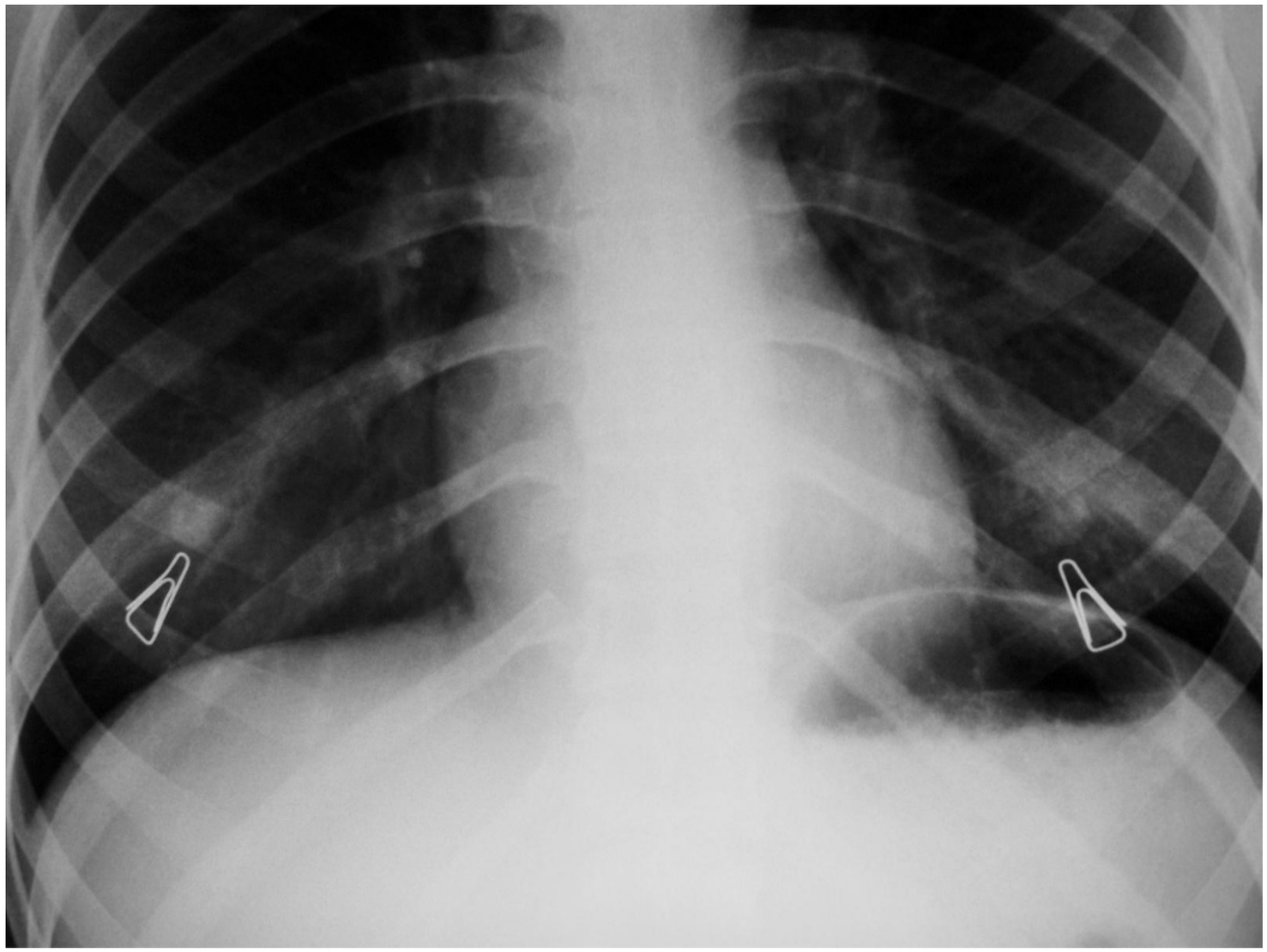


Fig 1.34:How to do nipple marker?

The easiest is to use a triangular paper clip, using a surgical tape, paste it next to the nipple with the pointed end pointing to the nipple. Then repeat PA view.
There are other materials you can use as nipple marker.

Basic principles are:

a. Patient's modesty to be maintained at all times
b. Female radiographer preferred
c. Don't use material that may harm / cut the skin
d. Material is opaque enough to be seen on x-ray
e. Material doesn't block the nipple shadow on the final image
f. Repeat only if you are not sure and repeat only once. Ensure, no unnecessary radiation to patient.

Repeat CXR with nipple marker if needed. But avoid harm to patient.

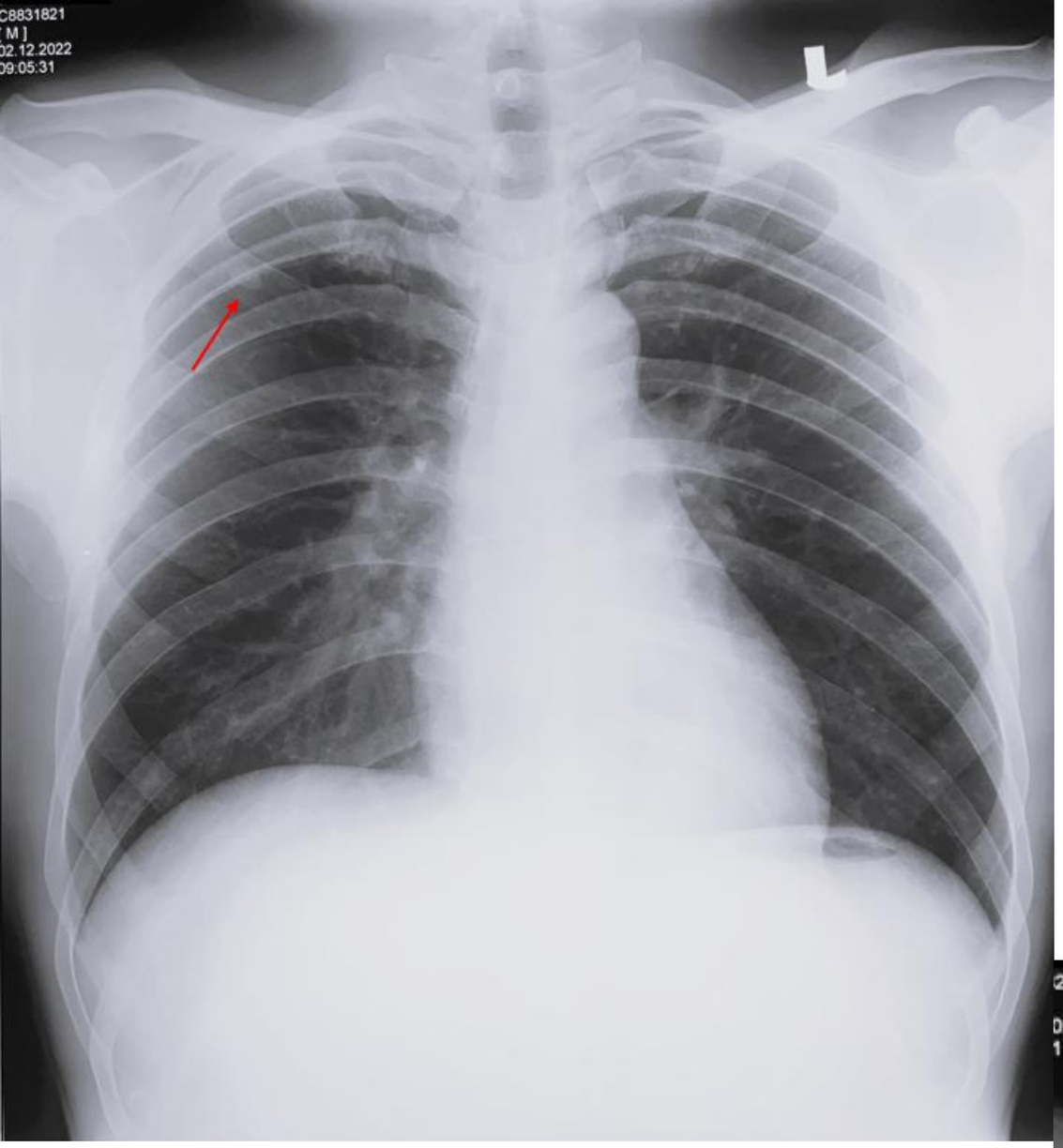


Fig 1.35: PA view reported as 8mm granuloma RUZ

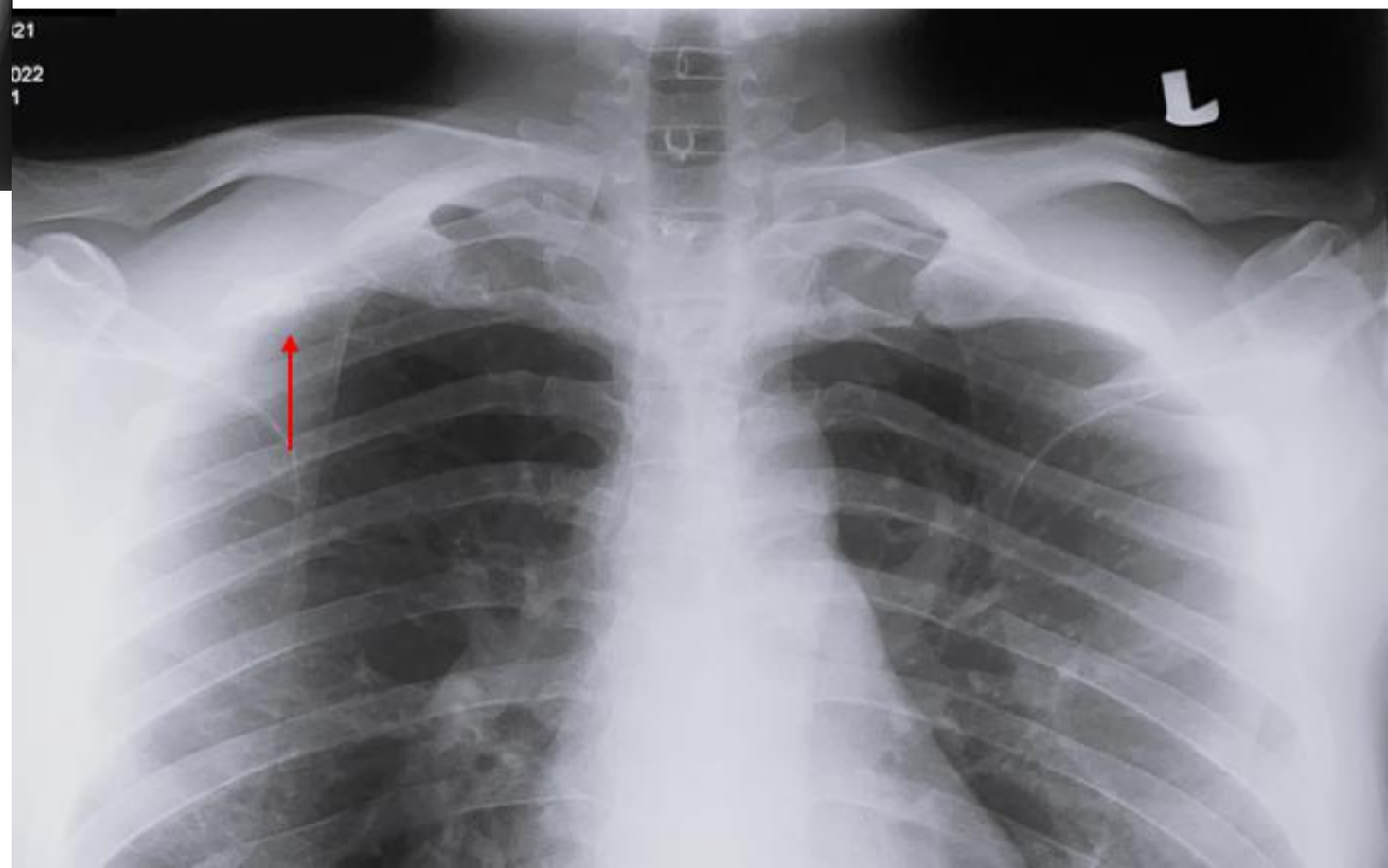


Fig 1.36: Apical view was done
The 'nodule' is at the right 2nd rib on both PA & apical view. This is a bone island.
Bone island is a great mimicker.

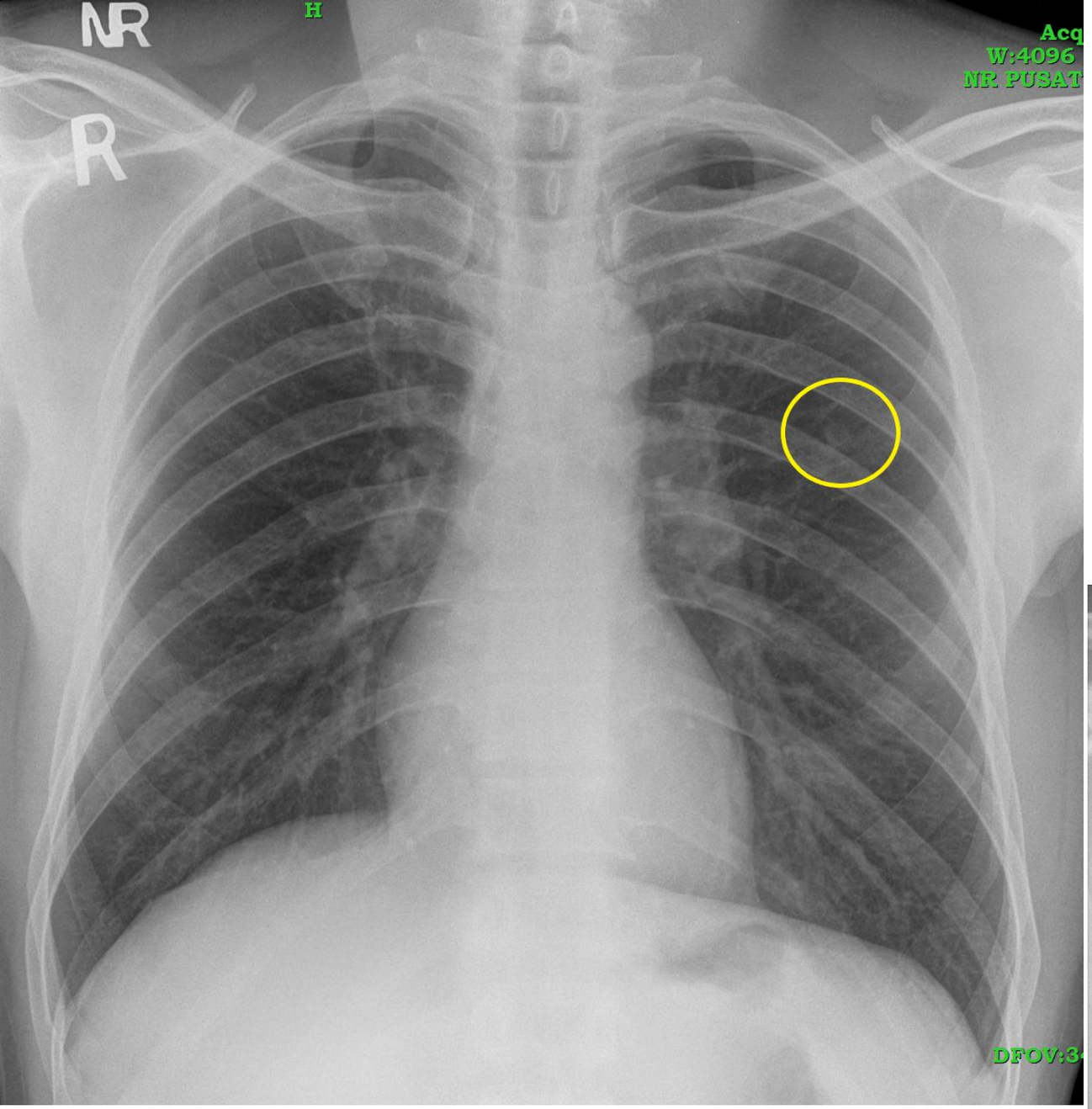


Fig 1.37: PA view audited as granuloma LMZ

Really? Is that a granuloma?

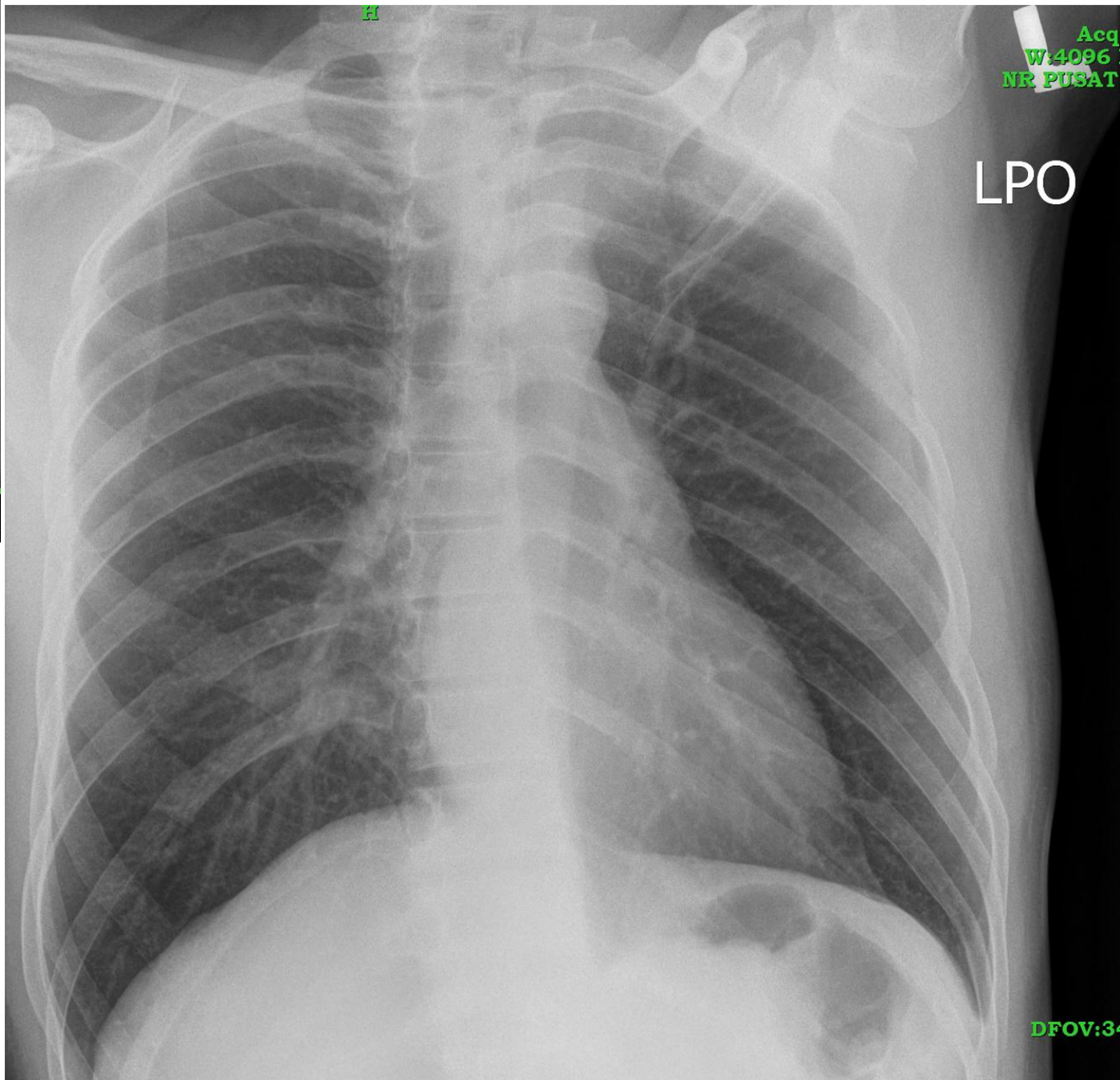


Fig 1.38: LPO view was done
The ‘granuloma’ is not there anymore!
This is just composite shadows made up by a few blood vessels nearby.
Composite shadow is a great mimicker.
When in doubt, even after being audited by Fomema, do extra views.

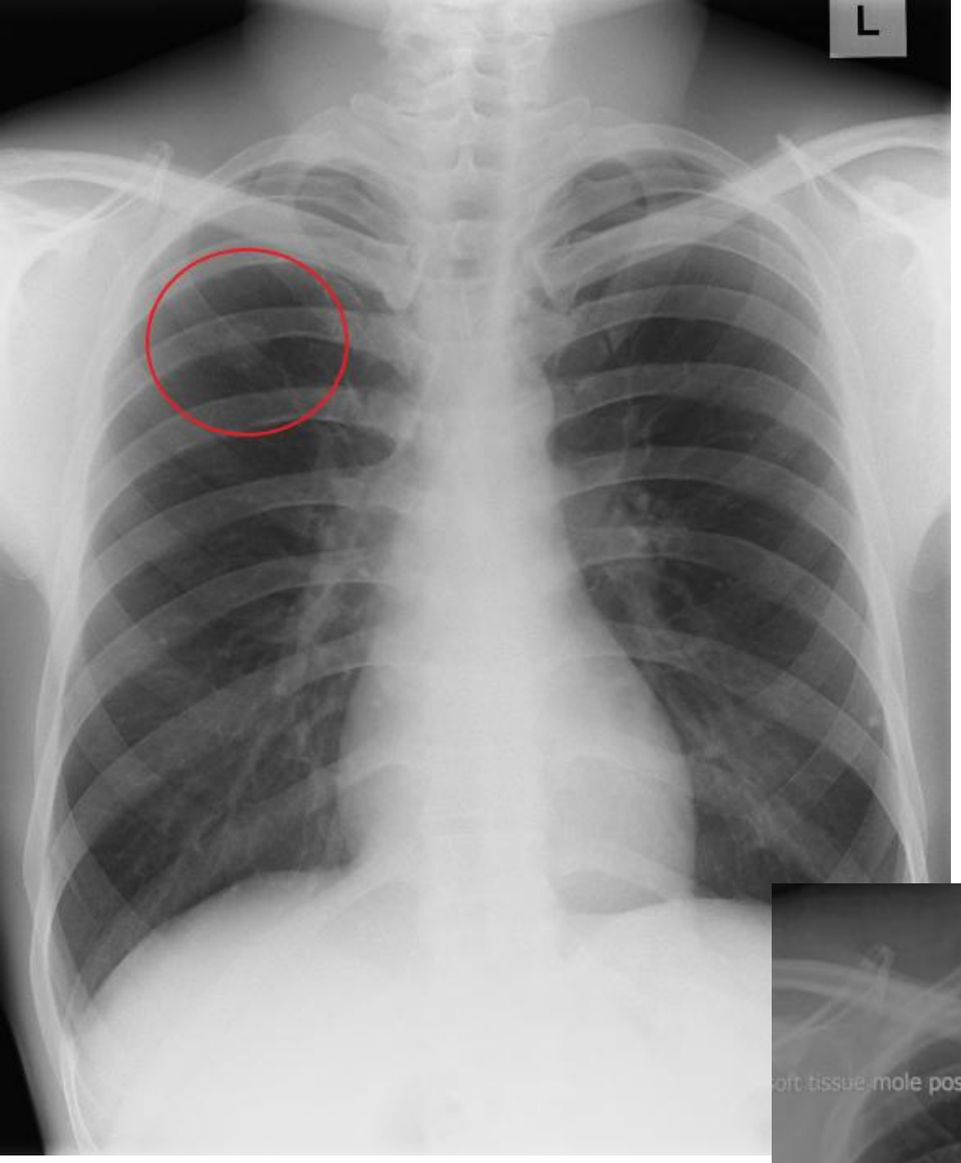
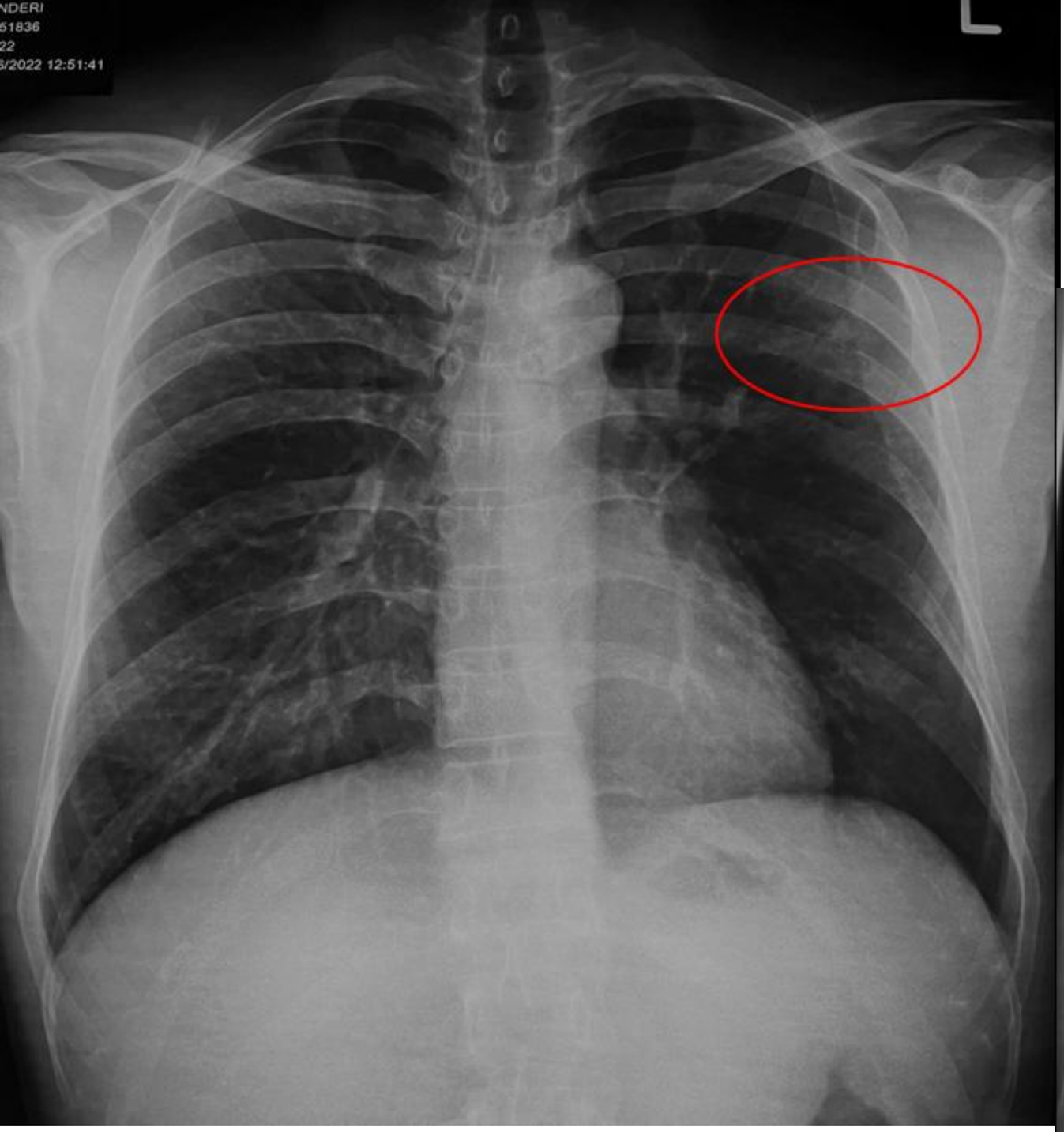


Fig 1.39: PA view reported as granuloma RUZ

Really? Is that a granuloma?
Look at the shape, its so round.
Look at the margin, its so well-defined.
Granuloma tends to be a bit oval and irregular margin.

Fig 1.40: The image was repeated with additional oblique view.
The radiographer had also annotated on the image, presence of a mole on the patient's back!
This is what I would like all radiographers to do. Check patient physically for anything that might create confusion and annotate on the image so that we know.

Fig 1.41: PA view reported as 11mm granuloma LUZ



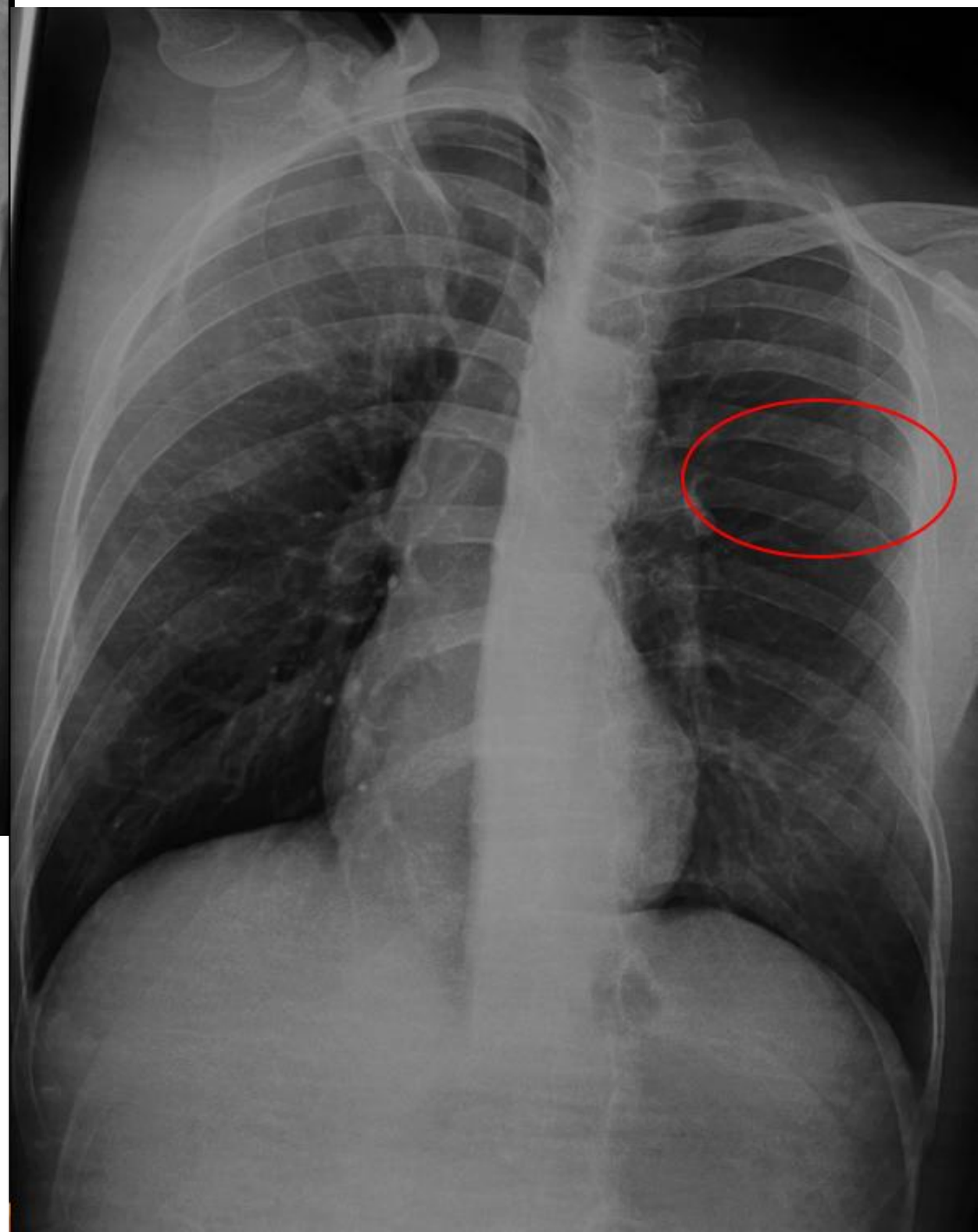


Fig 1.42: Oblique view confirmed it (circled)

But is this the right oblique view?
This is an LAO – left anterior oblique.
The correct view is LPO – left posterior oblique.
In LPO, the left chest opens up and you can see more of the left lung field. In LAO, the left chest is foreshortened and you see less of left lung field.
Radiographers, please learn the correct view to do.

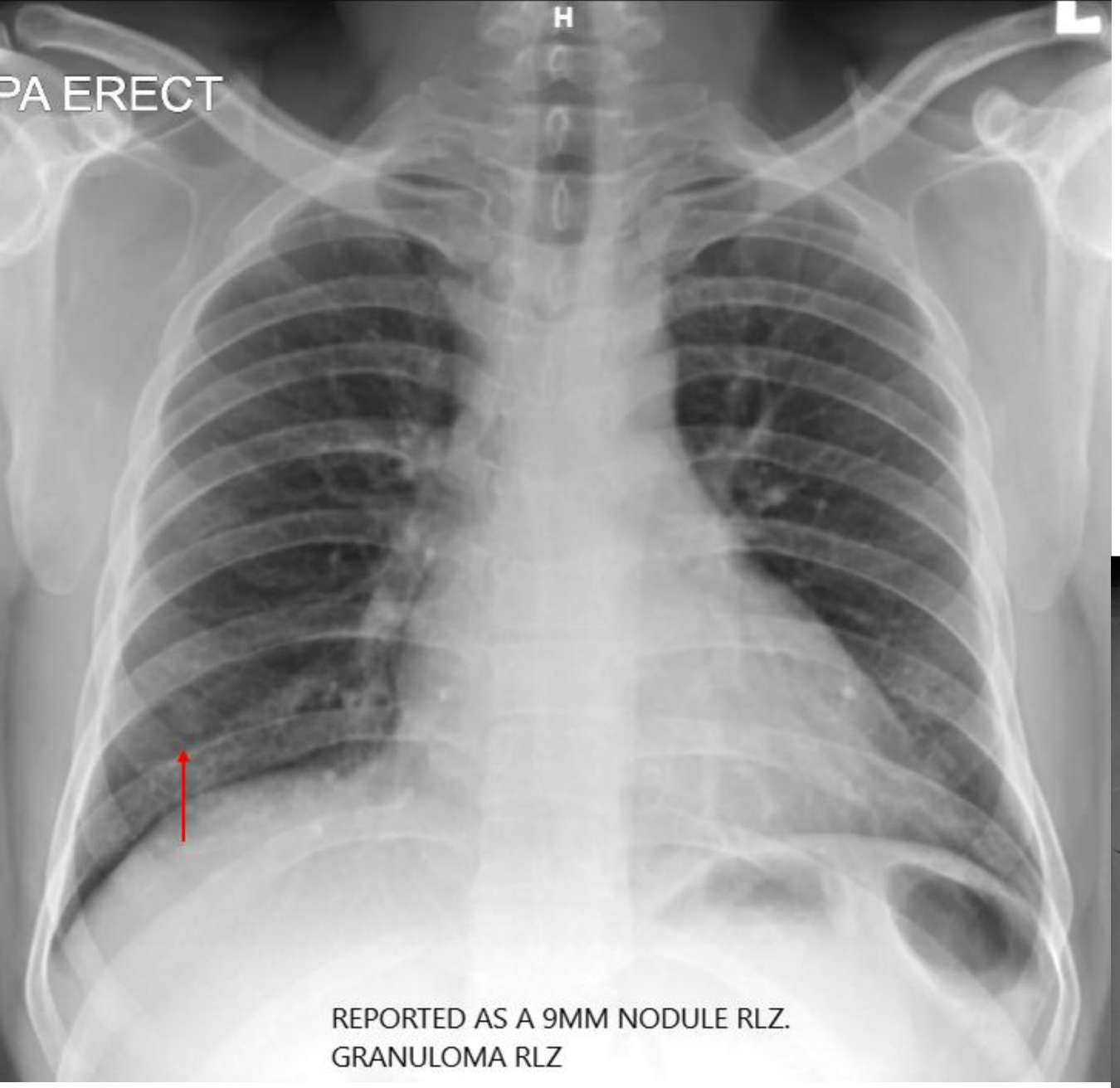
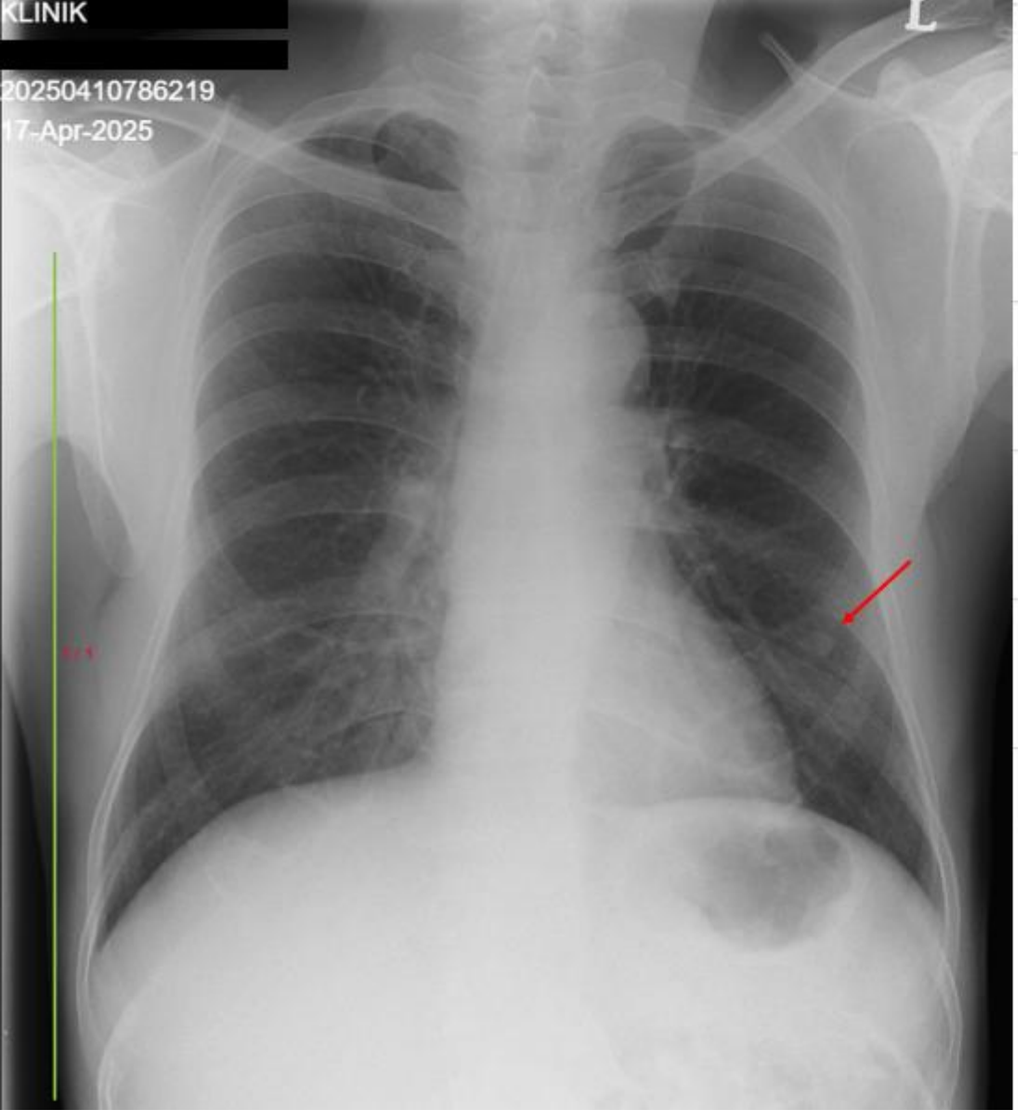


Fig 1.43: Reported as 9mm granuloma RLZ

Is that so? Do you agree?

Fig 1.44: Repeat PA shows the ‘granuloma’ has disappeared!

That is actually nipple shadow.
Why sometimes you see nipple, sometimes you don’t? it depends on the position of nipple relative to the tangential x-ray beam.
Sometimes you see only one side, sometimes you see both sides.
You can see nipple in man too.



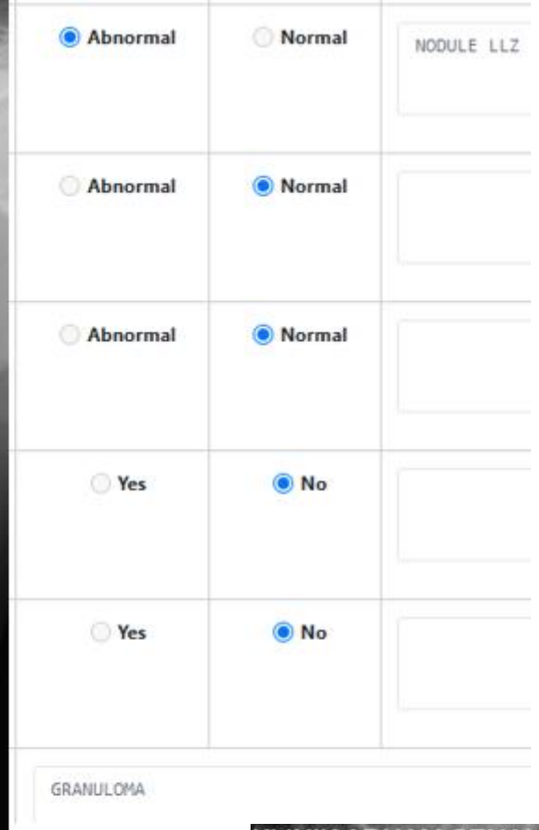


Fig 1.45: A fairly large nodule reported as granuloma. Do you agree?

I don't think so. I think its left nipple.
How am I so sure?

a. It is nice and round
b. It is about a cm in diameter
c. It is in the 5th intercoastal space where I expect the nipple to be

The x-ray should have been repeated with nipple marker.
But this is a guy?
Well, guys have nipple too!

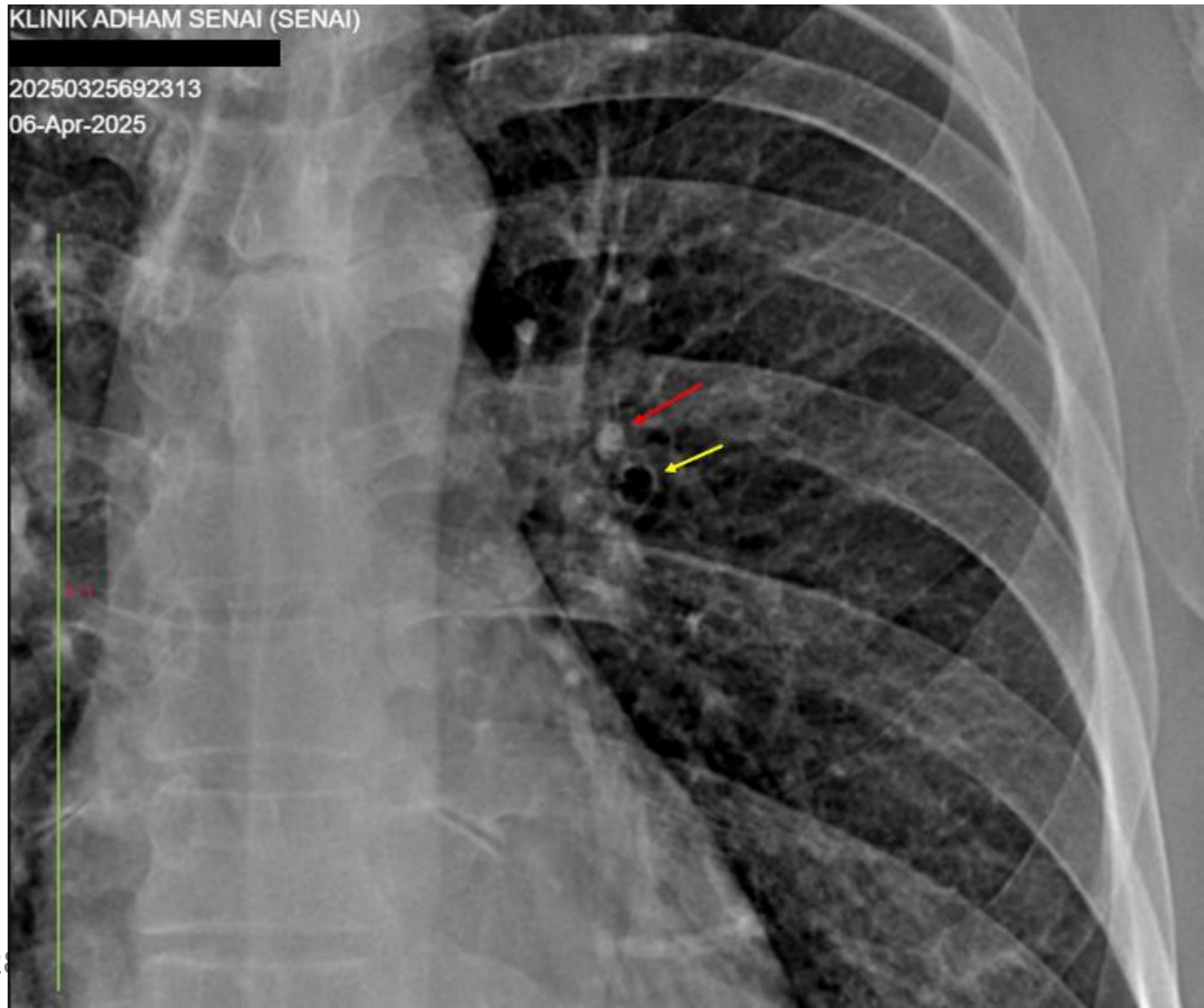


Fig 1.46: Red is blood vessel and yellow is end on bronchus. Refer fig 1.11 – blood vessel and bronchus always go together from hilum to periphery.

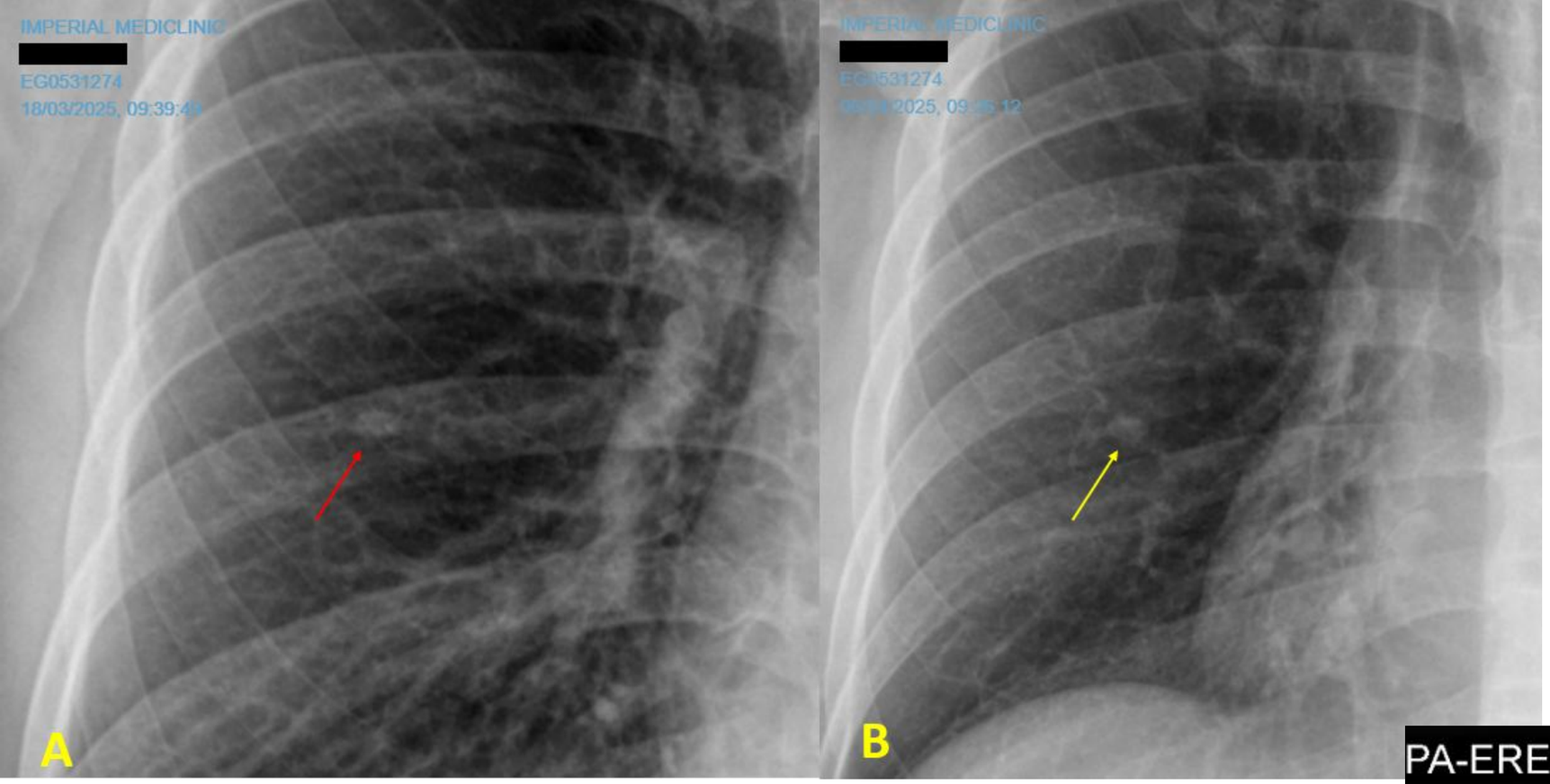


Fig 1.47: A showed a 7mm nodular lesion overlying the rib. Could this be bone island? Or a granuloma

B is repeat CXR with a different degree of inspiration showing that the nodule has now shift position to be in the intercoastal space.
This proves that it is not a bone island.
As it is 7mm in size, this granuloma is UNSUITABLE.

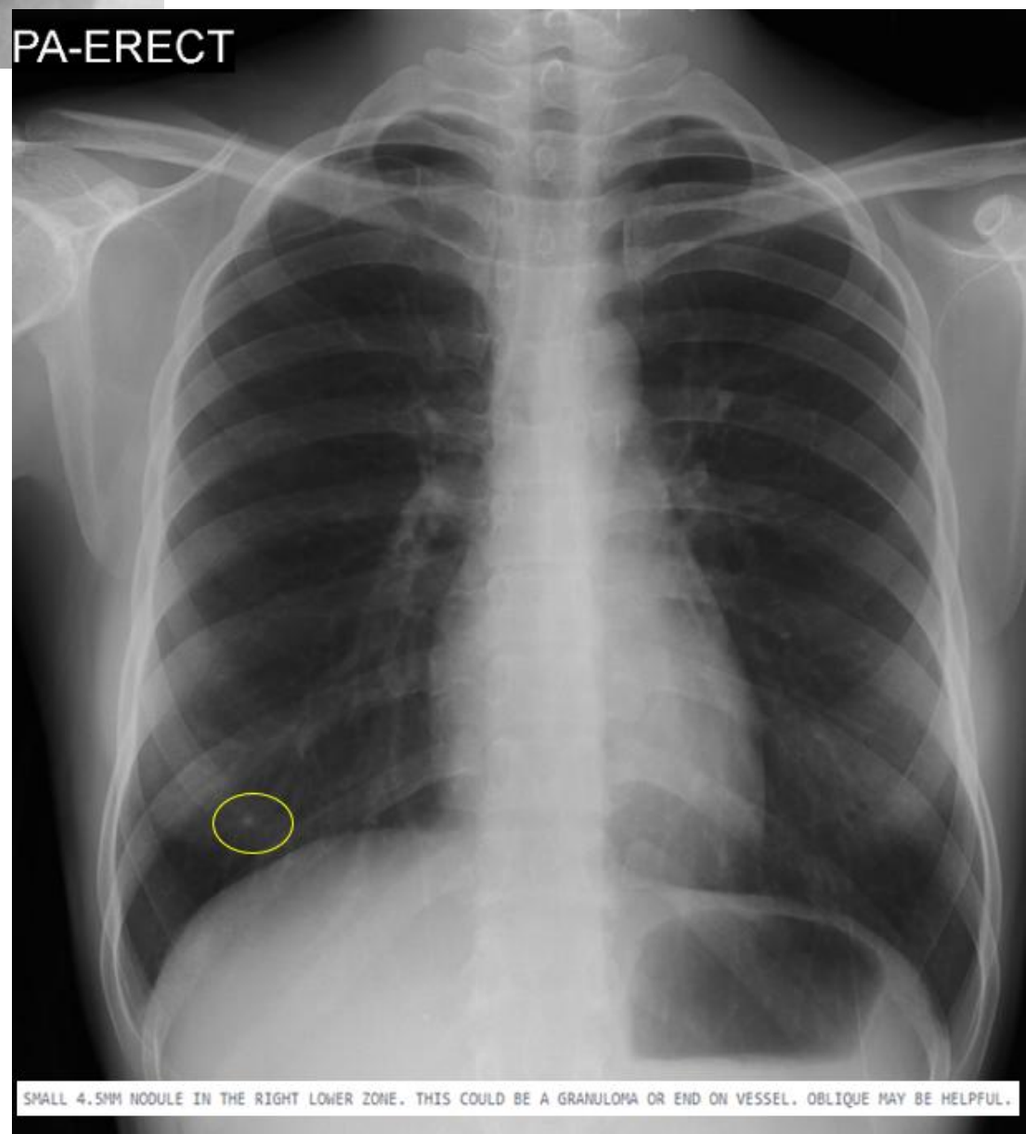


Fig 1.48: See the attached report.
If the nodule is 4.5mm, our cut off for granuloma is 5mm, why do you need to do oblique view?
In my opinion, this is just end on vessel.
Lets not to over read our CXR. Over reading causes more issues with appeals and increases cost.

Pulmonary Granuloma

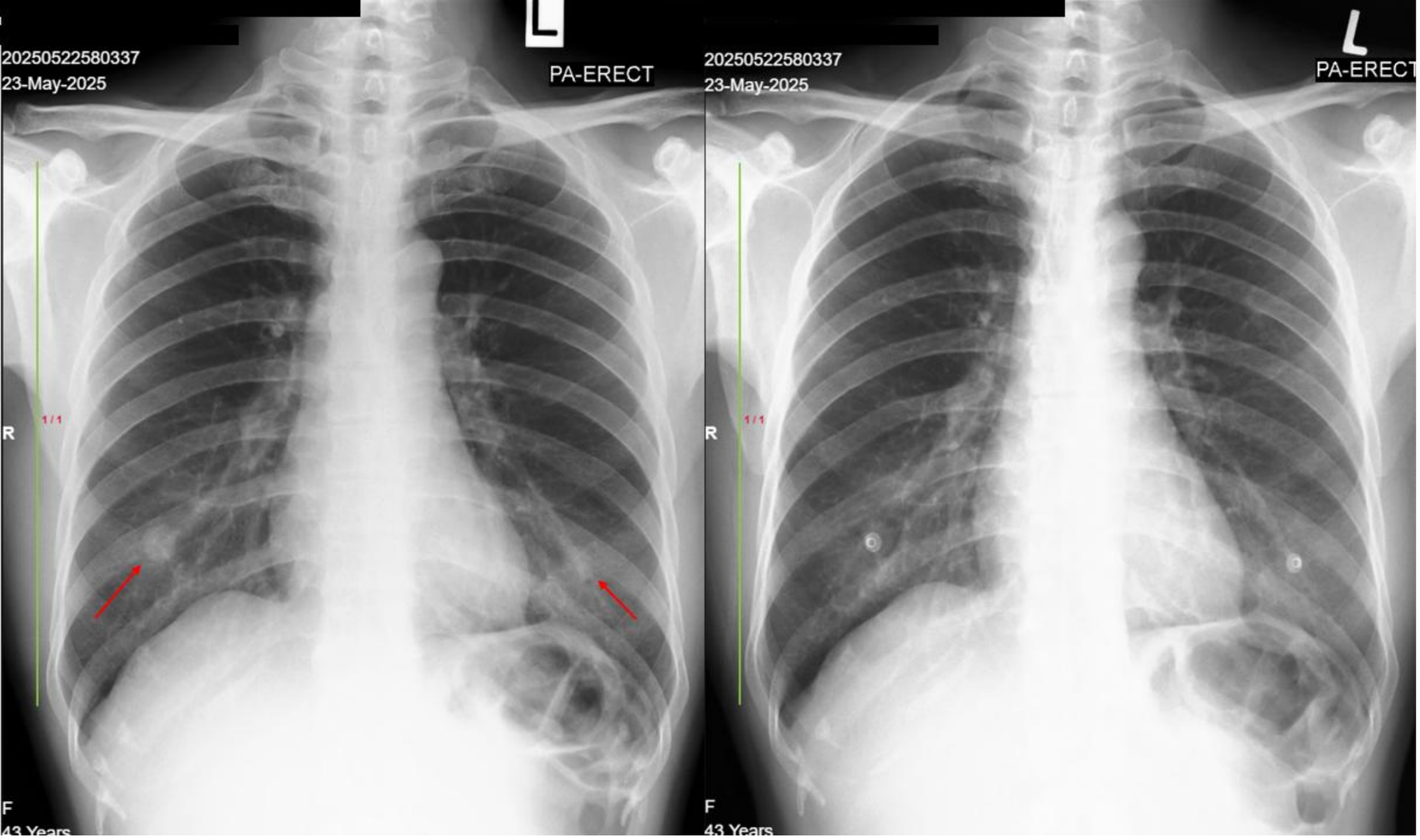
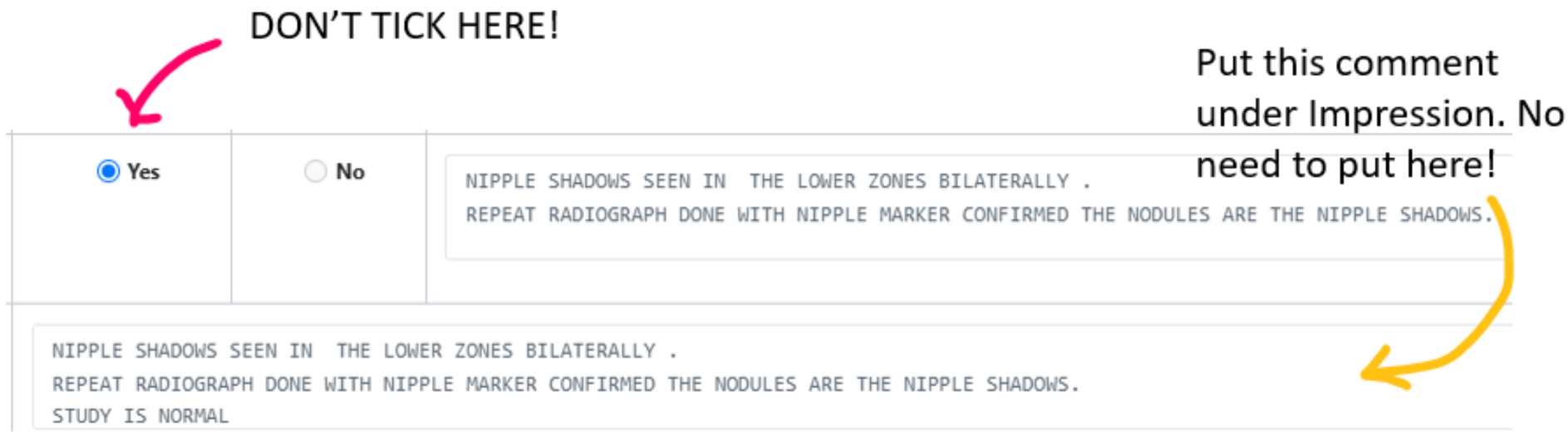


Fig 1.49: Its good that the doctor had picked up the nodular lesions at both bases and repeated CXR with nipple marker.

It confirmed beyond doubt that these are nipple shadows.

Fig 1.50: But why did he ticked the abnormal column? That makes the report UNSUITABLE.
Don't tick the abnormal column and put the comments in the Impression box. That will make this report SUITABLE.



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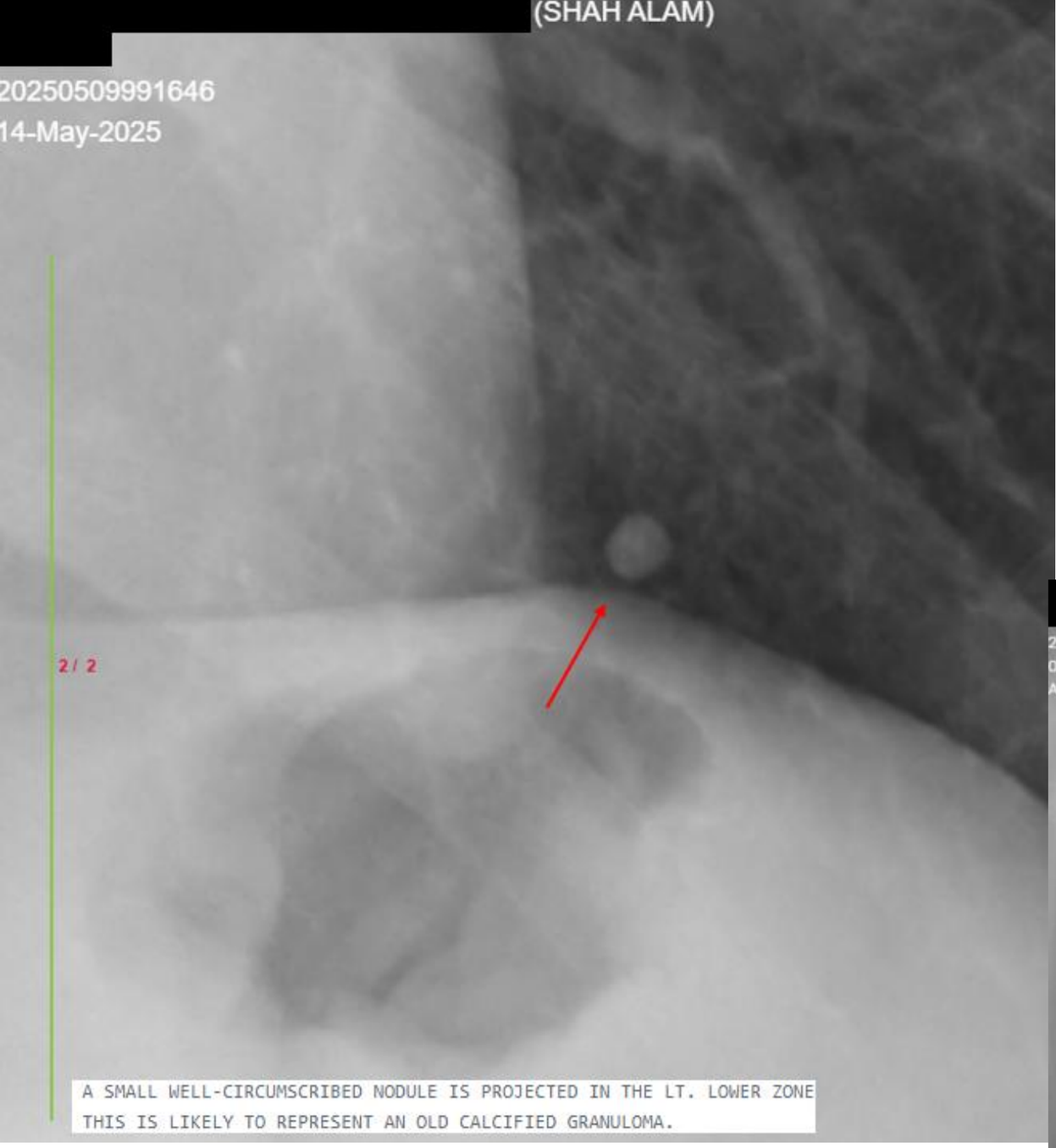


Fig 1.51: Reported as old calcified granuloma - UNSUITABLE.

I agree
But, there s something very important missing – what is the diameter?
If that granuloma is <5mm, it is suitable.
If it is >5mm, it is not suitable.
This granuloma happens to measure 7mm – UNSUITABLE.

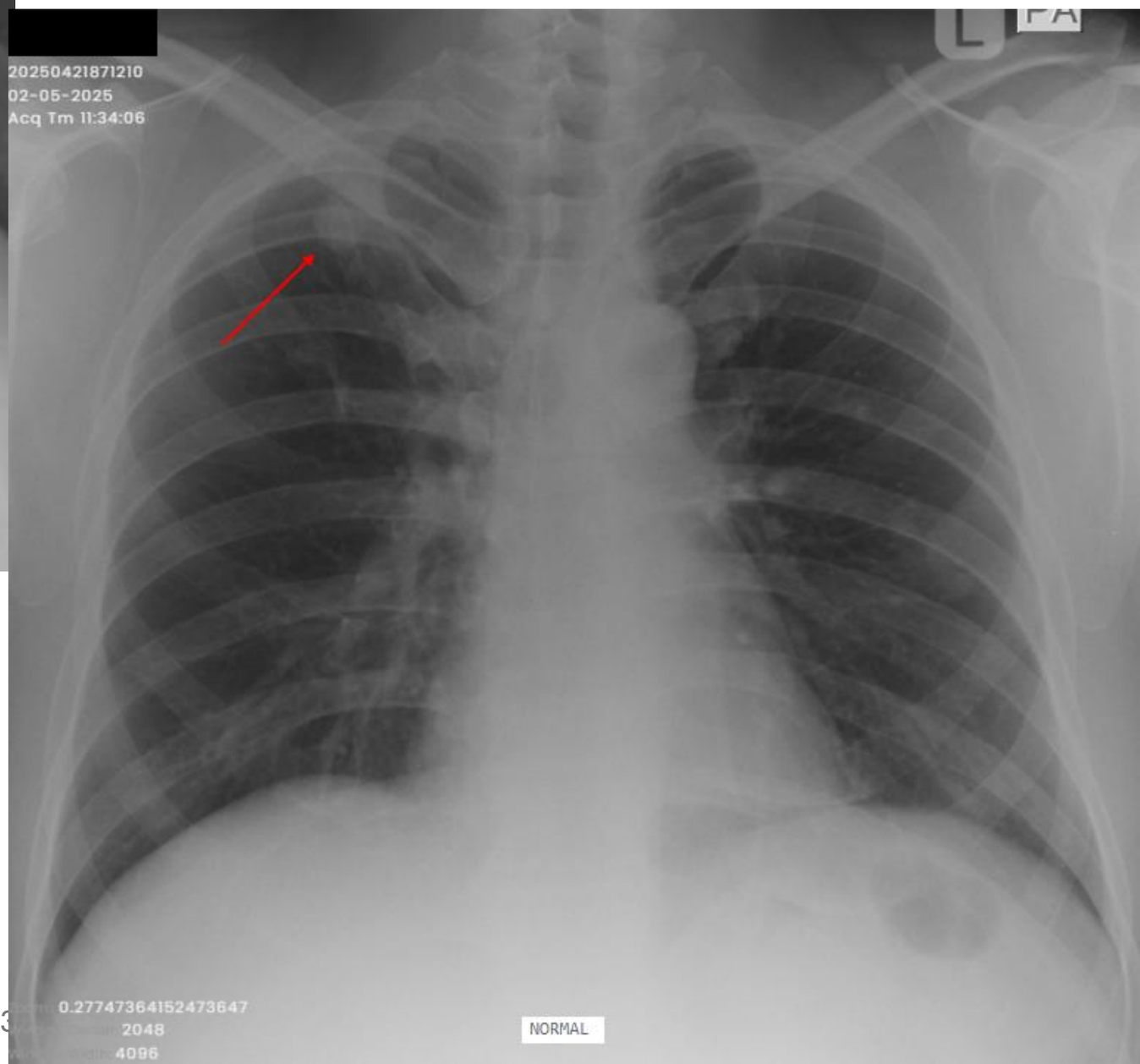
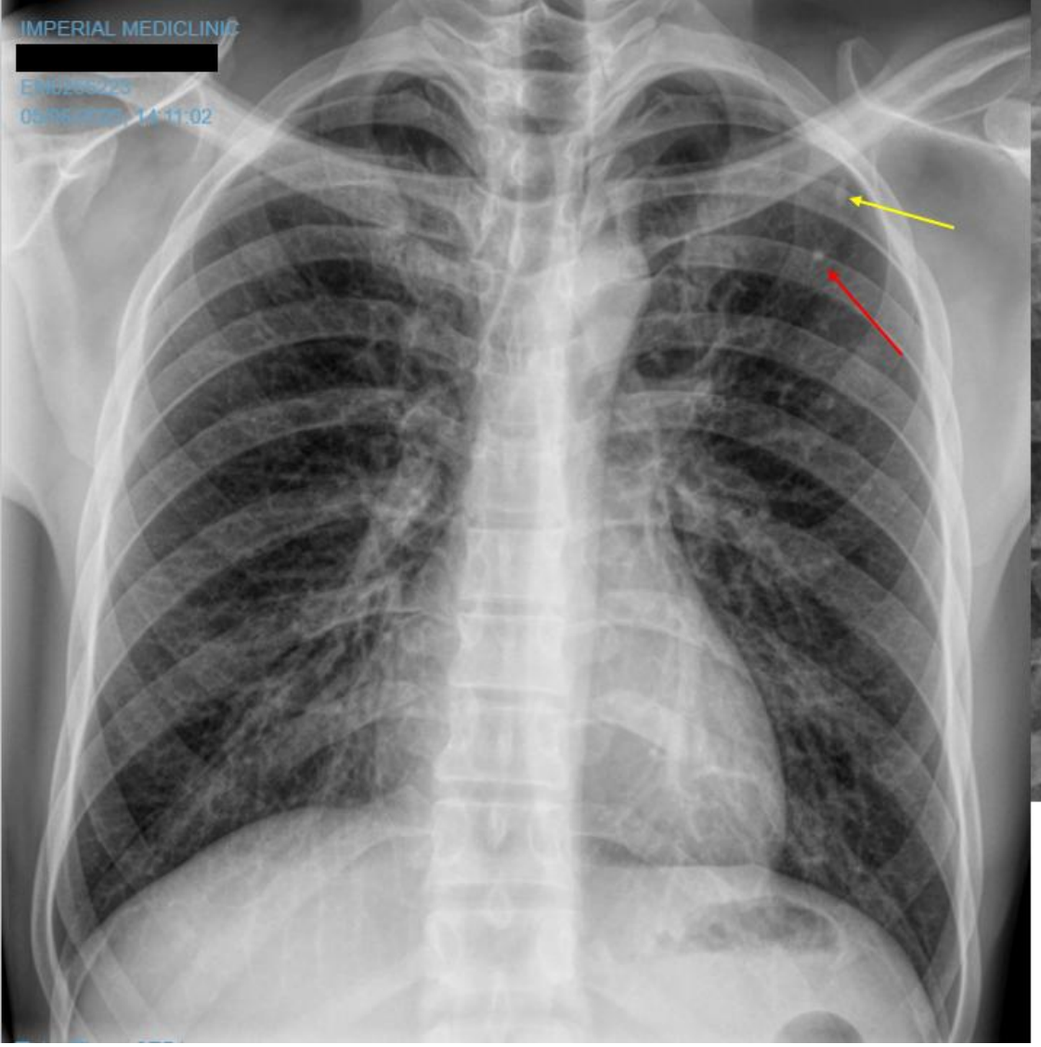


Fig 1.52: Reported NORMAL

As I have been saying, the apices are the most difficult areas to assess due to overlapping structures.
There is a 1cm nodular lesion at RUZ - UNSUITABLE.

Pulmonary Granuloma



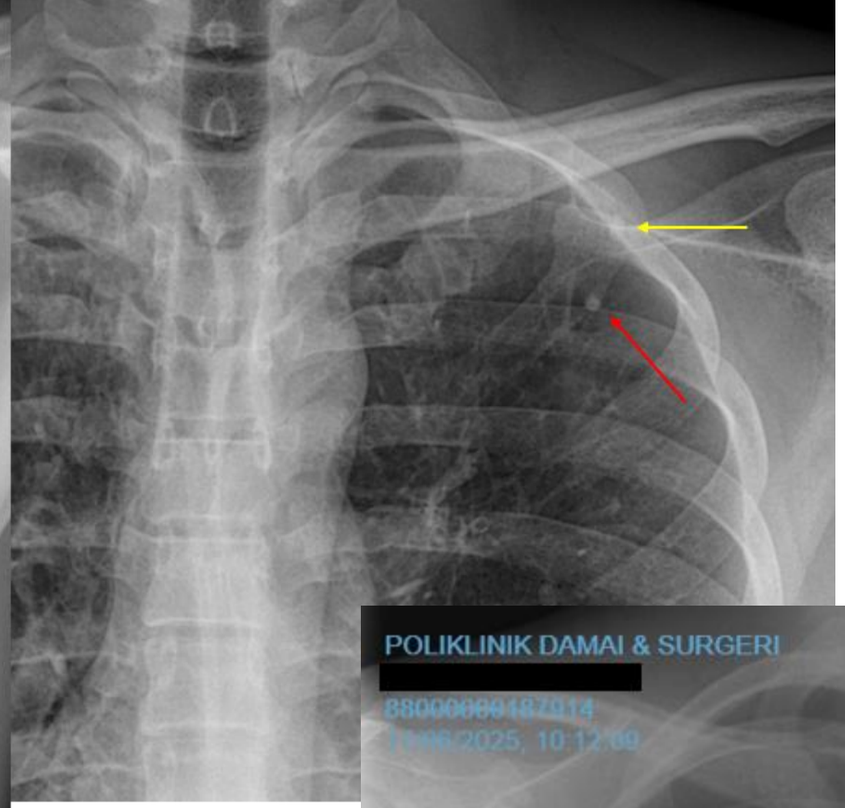


Fig 1.53: On PA view, there are 2 nodular lesions overlying the 2nd left rib.
Apical view helps to solve it. Red arrow pointing to granuloma and yellow arrow to bone island.
The granuloma has changed its position relative to 2nd rib but the bone island, remains on the 2nd rib.

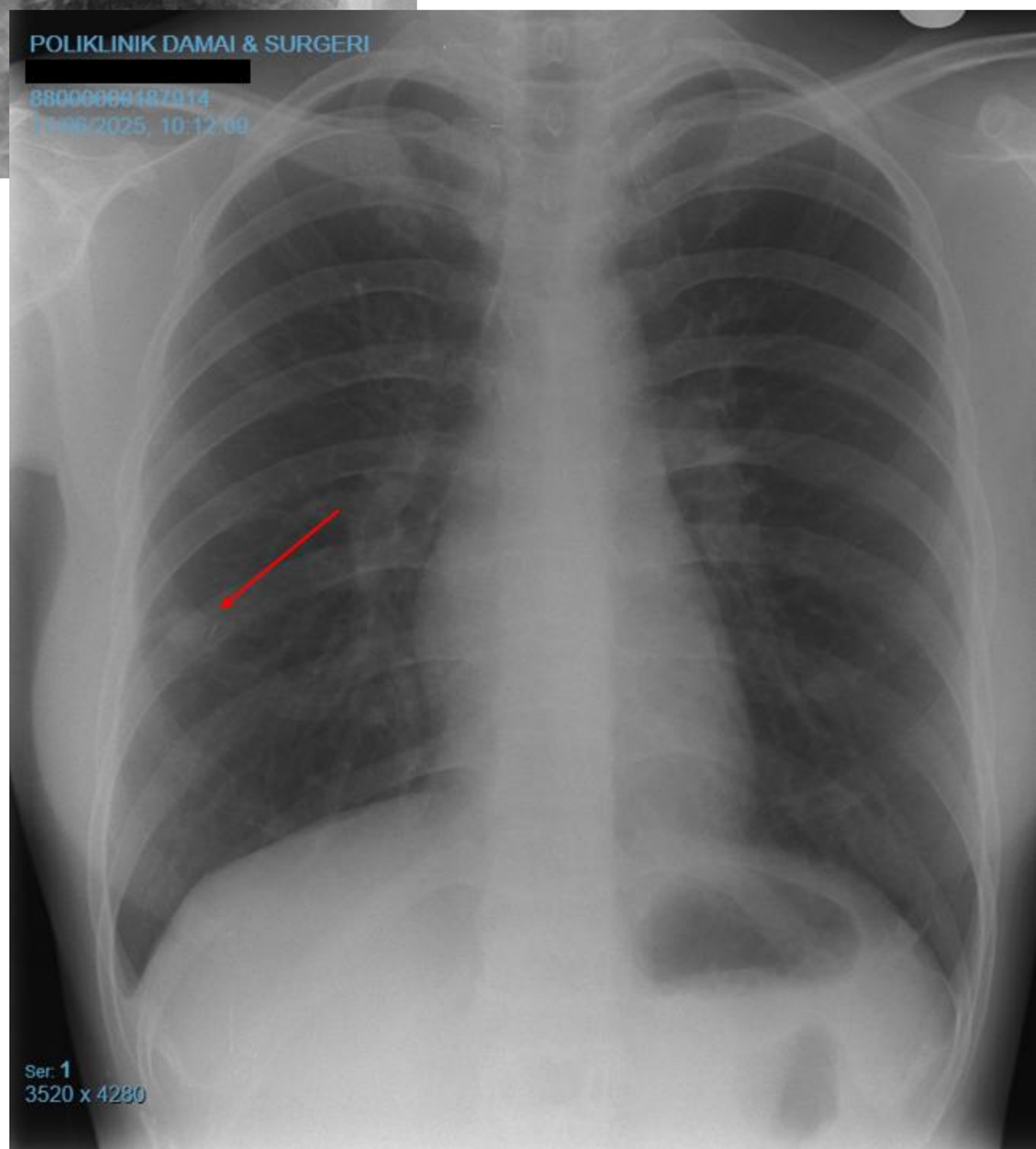


Fig 1.54: 1.5cm nodular lesion right lower zone – nipple or granuloma?

I think its granuloma. Why?
1. Too high for nipple
2. The margin appears irregular

This kind of cases require a repeat with nipple marker.

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NOTES

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