Pulmonary Tuberculosis: Role of Radiology in Diagnosis and Management

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testing, then we do a chest x-ray. This is where the radiologists comes into play and it’s really I think important to recognize the slight differences in management with these three legs. So let’s take the first leg on the left, the normal or calcified granuloma. So if the chest x-ray is normal or there’s just a calcified granuloma or a calcified lymph node, that’s considered to be the least I guess important we can think of and the clinician may or may not treat these patients for latent TB. The time when they may decide to treat these patients is if they have a high risk factor for reactivation so not the high risk factor for exposure which got them into this algorithm, but specifically the high risk factor for reactivation. So that’s where that came in. The next leg is the fibronodular changes. So with the fibronodular changes I think that’s important for us to recognize on radiograph because sometimes we have patients with bifocal scarring and it’s minimal and it’s mostly symmetric and often times it’s thought to be related to ischemic changes, but if we detect that there’s asymmetry, there’s more scarring on one side, there’s some other evidence like hilar retraction and traction bronchiolectasis then we should I think alert ourselves to think about the possibility of an inactive TB which can present with those fibronodular changes. So the next step once we detect that is to decide is that stable or it not stable and luckily if we have a comparison chest radiograph and it’s stable for six months, then we’re going on to saying that those patients should be treated for latent TB which is only a single drug therapy. But if we cannot establish that six month stability because there’s a lot of problem with getting previous check x-rays or we’re not sure if it’s really stable, then they should really be worked up for active TB because there could be harboring in that setting of fibronodular changes some manifestation of active TB. By workup for active TB we’re talking about getting sputum samples and testing with AFB nuclear gas amplification test and culture. Now the third leg, if that turns out to be negative then we would treat them for latent TB, but the third leg of the chest x-ray findings are if we have cavity or consolidation; and if the cavity or consolidation is noted, then that should make us think more of active TB and the patient should be worked up for active TB like we just described. One other point is interesting that if we have a cavity on the initial chest x-ray that actually changes their management in terms of how many months of active TB treatment they get. And you can see that on Figure 23 where if they have a positive chest x-ray finding of cavitation and the culture at two months after following the initial four drug treatment is positive, then those patients actually get a total of nine months treatment. But if either the initial chest x-ray did not have any cavitation, it’s okay if it has consolidation, but specifically not having cavitation, or the culture at two months is negative, then those people only get a total of six months of therapy.

**J.K.** Okay great, well thank you for that. So Arun we know that consolidation, cavitation, centrilobular nodules are a sort of hallmark imaging features of active postprimary tuberculosis, can we look at some CT findings that are associated with both active and inactive postprimary TB nicely illustrated in Figures 11 and 19 in the paper?

**A.C.N.** Okay great. So yeah I think that’s important to contrast the findings of active and inactive TB so on Figures 11 which has the chest x-ray and the CT, the arrows are pointing to consolidations so we’re seeing airspace opacities where we can, on a CT we can see air bronchograms through them and if it’s a noncontrast CT it would be hard to see the vessels through those areas of consolidation. The arrowheads are depicting cavities or rim opacities with internal lucentcies and those findings are easier to see on a CT but the management pathways are really dependent on whether you see the cavitation on the chest x-ray. Now for inactive TB which we will see on Figure 19, the chest x-ray and CT findings show scarring and retraction and that’s kind of the hallmark to think of fibronodular changes due to an inactive TB. When you start to see evidence of retraction, the hilum is pulled superiorly the arrowhead is pointing near areas of traction bronchiolectasis with some bronchial wall thickening in those areas, and the arrow is pointing to what looks like a thin walled cavity. And that’s the problem with knowing for sure whether these patients with fibronodular changes and it might even look like a cavity, whether they are harboring any active TB.

**J.K.** Sure. Well great, so going on to Table 4, you provide a very nice template for the use in reporting the results of chest radiographs which are obtained in patients with suspected latent or active tuberculosis. Can we look at this and have you review the pertinent components of the radiology report in this setting?

**A.C.N.** Sure Jeff. In Table 4 is a sample of a report template and it can be used for structured reporting. The findings and the impression are the only parts in the table so I think it’s important when we look at chest x-rays especially in patients who it says evaluate for tuberculosis or employee health screening or patient is on TNF alpha inhibitor type medication or immunosuppression so they’re looking for those findings. They may not specifically mention that they want to look for TB. So keeping that in mind we should always mention whether there is or not cavitation or consolidation or a nodular pattern. Those are all the kind of things that can be seen in active TB. And also to mention if there is or not fibronodular changes because I think if we say that then we would actually look for it and that could be a finding in inactive TB. And also it’s good to mention the presence of calcified granulomas, calcified lymph nodes, even those specifically are not related to an increased risk for reactivation, but it just kind of gives an idea. The patients obviously could have been exposed to other antigens like from fungus, histo and sarcoid related calcified lymph nodes so it’s not very specific. It’s also good to mention mediastinal hilar lymphadenopathy because that would be a feature of primary tuberculosis and pleural effusion which would also be a finding that could be seen in primary and postprimary, a little bit more in primary. For the impression we have a pick list of five choices and so whichever one is applicable you could choose. You would choose no evidence of active or previous tuberculosis if there was absolutely nothing on the chest x-ray. If it’s calcified granulomas alone or calcified lymph nodes alone you could say it’s consistent with old
granulomatous infection and there’s a slight wording use of choice here. Infection is more commonly used in the literature, at least clinically, when there is a latent infection and the word disease is used more in the clinically literature when there’s actually been active disease or previous but now inactive disease. I think in radiology we tend to use the terms interchangeably but it might be preferable to use old granulomatous infection when we’re talking about just a latent infection.

J.K. Sure.

A.C.N. The next one is stable fibronodular opacities for six months. If we could establish that that would be great and then you could just say it’s inactive TB, but then if fibronodular changes are of uncertain activity because we don’t have that previous chest x-ray then, or we’re not sure, then we could recommend that they obtain the imaging and provide it to us. And also we could recommend that the clinicians do an evaluation for active TB and I think it’s important to communicate those findings to a referring provider. The findings that likely represent active TB, for those findings we should recommend that the patient be isolated, respiratory isolation, and work up be done for active TB like sputum sampling and to communicate those findings as well. Some facilities have an infection control and so these would be situations when you’re notifying people that would be a good place to notify because the people at infection control those personnel they make sure that the ball isn’t dropped and those particular patients are looked after.

J.K. Yes, it’s very, very important obviously when you begin talking to folks in infectious disease and infection control and you raise the possibility of active tuberculosis and obviously begins a process of fairly significant evaluation and management which you know you don’t want to take lightly. So that’s very important. Well Arun thank you very much for joining us. I’d like to thank Dr. Nachiappan for joining us today to discuss his paper in the current January 2017 issue of the journal.

A.C.N. Jeff I’d like to thank you as well because you gave us the opportunity to present this in *RadioGraphics* and we’re very excited to be part of this. Thank you.

J.K. Thanks very much.