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FULL PAPER

Osteoradionecrosis of the subaxial cervical spine following treatment for head and neck carcinomas

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Objective: To study MRI and positron emission tomography (PET)/CT imaging of osteoradionecrosis (ORN) of the subaxial cervical spine, a serious long-term complication of radiation therapy (RT) for head and neck cancers that can lead to pain, vertebral instability, myelopathy and cord compression.

Methods: This is a single-institution retrospective review of patients diagnosed and treated for ORN of the subaxial cervical spine following surgery and radiation for head and neck cancer.

Results: We report PET/CT imaging and MRI for four patients, each with extensive treatment for recurrent head and neck cancer. Osteomyelitis (OM) and discitis are the end-stage manifestations of ORN of the subaxial spine.

Conclusion: ORN of the subaxial spine has variable imaging appearance and needs to be differentiated from recurrent or metastatic disease. Surgical violation of the posterior pharyngeal wall on top of the compromised vasculature in patients treated heavily with RT may pre-dispose the subaxial cervical vertebrae to ORN, with possible resultant OM and discitis. MRI and PET/CT imaging are complementary in this setting. PET/CT images may be misinterpreted in view of the history of head and neck cancer. MRI should be utilized for definitive diagnosis of OM and discitis in view of its imaging specificity.

Advances in knowledge: We identify the end-stage manifestation of ORN in the sub-axial spine on PET/CT and MRI to facilitate its correct diagnosis.

Primary head and neck malignancies often require a combined surgical and chemoradiotherapeutic management strategy, which may affect the surrounding normal tissue. Osteoradionecrosis (ORN) is one such complication of radiation therapy (RT) for head and neck cancers. ORN is defined as radiation-induced ischaemic necrosis of bone and soft tissue in the absence of local primary tumour, recurrence or metastatic disease.¹ RT induces a hypoxic environment with resultant devascularization of the bone within the treated field, creating an area of tissue that is slow healing and pre-disposed to infection.²

ORN is reported most commonly in the mandible and less frequently in the maxilla following treatment for head and neck carcinomas.³ The presentation of mandibular ORN ranges from asymptomatic bone erosion to severe bone and soft-tissue necrosis, bone exposure, orocutaneous fistulas, periodontal disease and/or pathological fracture.⁴

Like the mandible and maxilla, the cervical spine lies within the irradiated field for head and neck cancer therapy, placing the poorly vascularized disc space and vertebrae at an increased risk of ischaemia and infection. ORN of the cervical spine is rare and has not been thoroughly studied. ORN of the upper cervical spine and base of skull has been reported following treatment of nasopharyngeal carcinoma.^{5,6}

ORN of the subaxial cervical spine has also been addressed in isolated case reports and retrospective studies. Like ORN of the mandible, the presentation of ORN of the cervical spine exists on a spectrum that includes pain, kyphosis, neuropathy, myelopathy, osteomyelitis (OM) and cord compression.^{5,7,8}

As in advanced ORN of the mandible, maxilla and upper cervical spine, we focus on OM and discitis as the end-stage manifestation of subaxial cervical spine ORN, a pattern that should be recognized by radiologists to avoid misdiagnosis.^{2,8} We report imaging findings of four cases of ORN of the

subaxial cervical spine following surgery and RT for head and neck cancer and a review of 12 cases in the literature.⁷⁻¹²

METHODS AND MATERIALS

Records from January 2000 through January 2013 pertaining to patients diagnosed and treated for ORN of the subaxial cervical spine following treatment for head and neck cancer were reviewed following exempt status from the local institutional review board.

We conducted a comprehensive search of the English language literature in the National Institutes of Health PubMed database using combinations of the terms osteoradionecrosis, osteomyelitis and cervical spine. Articles for all published cases of ORN involving the subaxial cervical spine (C3 and lower) were retrieved, and data were extracted regarding clinical history, presentation and management. Cases were excluded if there was no ORN involvement below C2 or if there was involvement of the atlas or skull.

RESULTS

In our records, we identified four patients who developed ORN of the sub-axial spine following RT treatment for head and neck carcinomas. Clinical and radiographic findings are summarized in [Tables 1](#) and [2](#). Three patients were male and one was female, and each had an extensive history of head and neck cancer. The average age at the time of diagnosis of ORN was 61.75 years (range = 53–71 years). ORN developed 4–9 years following initial treatment for head and neck carcinoma, and the average duration of time between the most recent RT to diagnosis of ORN was 38.5 months (range = 3–96 months). Three of the patients received intensity-modulated RT (IMRT). One patient received external beam radiation. Three of the patients had multiple recurrences that required additional RT in the form of IMRT. Additionally, all four patients had previous surgery, including surgery involving the posterior pharyngeal wall (PPW) for treatment of head and neck cancer. In each case, the onset of ORN was rapid, as normal C-spine appearance was seen on imaging examination 5–6 months prior to the diagnosis of ORN ([Figure 1c](#)).

Table 1. Clinical features and management of four patients with subaxial cervical spine osteoradionecrosis (ORN)

Case	Primary diagnosis, radiation dose	Recurrence, radiation dose	Total radiation therapy dose (Gy)	Time from last radiation therapy to ORN (months)	Age at diagnosis of ORN (years)	ORN site	ORN symptoms	ORN treatment
1	T4N2cM0 pyriform sinus SCC, 63 Gy PORT	Retropharyngeal lymph node, 66.6 Gy PORT	129.6	26	53	C4–C5, epidural disease	Neck pain, odynophagia	Debridement, antifungal medications, HBO
2	T2N0M0 palatine tonsil SCC, no radiation	1. T2N0M0 hypopharynx, CXRT 70 Gy 2. T1/T4N0M0 L/R retromolar trigone 3. T1N0M0 PPW, 15 Gy IORT	85	29	55	C3–C6, epidural disease	Neck pain, inability to lift head, paraesthesia and bilateral arm weakness, cord oedema	Corpectomy and fibular free flap
3	T4N0M0 base of tongue SCC, 72 Gy	PPW, surgery without radiation	72	96	71	C3–C5, epidural disease	Neck pain, inability to lift head	HBO, i.v. antibiotics
4	T3N0M0 base of tongue SCC, CXRT (full dose unavailable)	1. Base of tongue (T3N0M0), 61.2 Gy post-operative CXRT 2. Bilateral pyriform sinus (T1N0M0), 59.4 Gy PORT	>120.6	3	68	C7–T1, epidural disease	Neck pain, difficulty swallowing	HBO, i.v. antibiotics

CXRT, chemoradiation therapy; HBO, hyperbaric oxygen therapy; IORT, intraoperative radiation therapy; i.v., intravenous; L/R, bilateral; PORT, post-operative radiation therapy; PPW, posterior pharyngeal wall; SCC, squamous cell carcinoma.

Table 2. Positron emission tomography (PET)/CT imaging and MRI results of four patients with subaxial cervical spine osteoradionecrosis

Case	Imaging modality	Vertebrae	Disc space	Posterior pharyngeal wall	Epidural soft tissue	Original interpretation
1	PET/CT	SUV 4.2	SUV 6.2	SUV 8.9	SUV 0	Recurrent disease
	MRI	Enhancement	Rim enhancement	Enhancement	Solid enhancement	Discitis/OM
2	PET/CT	–	–	–	–	n/a
	MRI	Enhancement	Rim enhancement	Enhancement	Solid enhancement	Discitis/OM
3	PET/CT	–	–	–	–	n/a
	MRI	Enhancement	Rim enhancement	Enhancement	Solid enhancement	Discitis/OM
4	PET/CT	SUV 3.2	SUV 5.4	SUV 7.9	SUV 0	Recurrent disease
	MRI	Enhancement	Rim enhancement	Enhancement	Solid enhancement	Discitis/OM

n/a, not performed; OM, osteomyelitis; SUV, standardized uptake value.

All patients presented with neck pain. Two of the patients had difficulty lifting their head. One patient (Patient 2) demonstrated and presented with paraesthesias and bilateral arm weakness. The diagnosis of ORN was primarily based on imaging and clinical history. All four patients had cervical spine MRI at the time of diagnosis. Two patients also had positron emission tomography (PET)/CT examinations performed prior to MRI, which were initially interpreted as recurrent cancer (Table 2). ORN was confirmed histologically for Patients 1 and 2, as these patients were taken to the operating room for exploration and treatment. Pathological study showed necrotic bone, empty lacunae, fibrosis and plasmacytic infiltrate. No malignant cells were present. Cultures from the disc and adjacent vertebrae of Patient 1 grew *Candida albicans*. This patient was being treated for oral thrush of the month preceding surgical exploration. Cultures of the disc and vertebrae of Patient 2 grew *Veillonella* and *Staphylococci*. Biopsy was not performed for Patients 3 and 4. For these two patients, the diagnosis of ORN with OM and discitis was made based on typical imaging of disc space narrowing, and adjacent vertebral body signal changes and enhancement. In addition, both patients had elevated white blood cell count in conjunction with known symptomatology and history of malignancy and RT, confirming our imaging diagnosis. For example, for Patient 2, a CT study obtained 5 months prior to diagnosis of ORN demonstrated only sclerotic changes of the cervical vertebrae from prior radiation treatment (Figure 2c).

Patients 1 and 4 had initial PET/CT images. The PET/CT for Patient 1 showed abnormal hypermetabolic activity along the posterior hypopharyngeal wall, the adjacent disc space (C4/C5 disc space) and adjoining C4 and C5 vertebrae with standardized uptake values (SUVs) of 8.9, 6.2 and 4.2, respectively (Figure 2). The corresponding CT images from PET/CT imaging and MRI showed stable soft-tissue prominence within the post-operative PPW (Figure 2b,d). Minimal compression deformity with irregularity of the end plates of C4 and C5 vertebrae adjacent to the disc space was noted. The C4 and C5 vertebrae were of low signal on spin echo T_1 and fast spin echo (FSE) T_2 weighted imaging and showed avid enhancement on administration of contrast (Figure 2d). The MRI also showed ventral epidural

enhancement extending from C4 to C5 as well as abnormal enhancement within the C4 and C5 vertebral bodies with rim enhancement of the intervening disc space. Enhancing soft tissue was also noted within the posterior hypopharyngeal wall.

PET/CT on Patient 4 showed abnormal metabolic activity along the posteroinferior aspect of the neopharynx, proximal to the laryngeal stoma and the cervical oesophagus, adjacent disc space (C7/T1) and adjoining C7 and T1 vertebrae with SUVs of 7.9, 5.4 and 3.2, respectively. Significant collapse of the C7/T1 disc space with the associated enhancement was noted. There were mild-to-moderate compression deformities with end-plate irregularities of the C7 and T1 vertebrae adjacent to the disc space. The C7 and T1 vertebrae were hypointense on spin echo T_1 and FSE T_2 weighted imaging with enhancement on administration of contrast. In addition, MRI showed abnormal ventral epidural and pre-vertebral enhancement extending from C7 to T1 level.

Patients 2 and 3 only had MRI performed at the time of diagnosis. In Patient 2, the MRI showed reversal of normal cervical lordosis with the apex at C5 level, significant narrowing of the C4/C5, C5/C6 and C6/C7 disc spaces and severe compression deformities of C4, C5 and C6 vertebrae with cord compression (Figure 1). The corresponding vertebrae were of low signal on spin echo T_1 and T_2 weighted images and showed enhancement on administration of contrast. Ventral epidural soft-tissue prominence and enhancement extending from C2 to C6/C7 was noted. Pre-vertebral soft-tissue prominence and enhancement was noted from C2 to T1 level. Cord oedema was noted extending from C4 to C7.

MRI examination of Patient 3 showed significant collapse of the C4/C5 disc space with moderate compression deformity of C5 and mild compression deformity of C4. The C4 and C5 vertebrae were of low signal on spin echo T_1 and hyperintense on T_2 weighted images and showed enhancement on administration of contrast. The C4/C5 disc space showed rim enhancement. Ventral epidural enhancement extended from C4 to C5 with mild cord compression. Enhancement of the surrounding pre-vertebral soft tissue was noted.

Figure 1. A 55-year-old male (Patient 2) with osteomyelitis (OM) and discitis. Sagittal fat suppressed post-contrast T_1 weighted (a) and sagittal CT (b) images demonstrate multiple compression fractures and enhancement of C3 to C6 with associated rim enhancement of the corresponding disc spaces. In addition, adjacent epidural and retropharyngeal enhancement is noted. Sagittal CT image (c) obtained 5 months prior to diagnosis of osteoradionecrosis demonstrates only sclerotic changes of the cervical vertebrae from prior radiation treatment.

In summary, important MRI findings include disc involvement in addition to involvement of the adjacent vertebrae and the symmetry and contiguity of signal abnormalities involving adjacent vertebrae and the intervertebral disc space. These features were observed in all four cases. On PET imaging, extension of hypermetabolic activity in the disc space was observed in the sagittal plane.

DISCUSSION

ORN of the cervical spine is rare, with a reported incidence of approximately 1%.⁶ Much of the current literature on ORN of the cervical spine involves cases in which ORN involving the skull base to C2 develops following primary RT for nasopharyngeal malignancy.^{5–7} To our knowledge ORN of the subaxial cervical spine has been only addressed in 12 case reports and retrospective studies^{7–12} (Table 3). The subaxial cervical spine is defined as portion of the cervical spine extending from C3 to C7.

ORN is defined as radiation-induced ischaemic necrosis of the bone and soft tissue in the absence of local primary tumour, recurrence or metastatic disease.¹ The imaging and clinical presentation of mandibular ORN varies, ranging from asymptomatic bone erosion to severe necrosis, bone exposure, orocutaneous fistulas, periodontal disease, local or systemic sepsis, and/or pathological fracture.⁴ Similarly, patients with ORN of the cervical spine may be asymptomatic but can exhibit symptoms, including progressive neck pain, progressive kyphosis, paraesthesia, infectious symptoms, discitis, OM and compression of the vertebrae and spinal cord.^{5,7,8}

We propose that OM and discitis are end-stage manifestations of advanced ORN in the subaxial cervical spine. Although OM and discitis are not necessarily indicative of pre-existing ORN and may result from acute infection; the clinical history of these

patients is highly suggestive of chronic ORN. Additionally, ORN of the subaxial cervical spine may occur without OM and discitis, but infection is reported to accompany ORN in 8 of 12 cases of subaxial cervical spine ORN in the literature.^{6,8}

Based on previous reports and our experience, the risk of ORN and resultant OM and discitis is likely directly related to previous radiation dose and surgical violation of the PPW, the combination of which leads to the marked impairment of blood supply to the vertebral bodies.^{6,7} Repeated radiation treatments are becoming more common practice in the current era of increased longevity for patients with head and neck cancer and use of IMRT instead of external beam radiation therapy (EBRT). RT is known to cause poor vascularity to the surrounding bone, and especially an already avascular disc space, resulting in ORN.² Posterior pharyngectomy may further devascularize the adjacent vertebrae, confounding an already hypoxic environment and creating an area of tissue that is unable to resist infection.⁸ Additionally, to obtain clear margins in posterior pharyngectomy, the deep cervical fascia is violated, thereby exposing the already devascularized disc space and vertebrae to aerodigestive tract secretions. This combination of insults—radiation-induced necrosis and post-surgical exposure to infectious agents—to the cervical vertebrae may result in OM and discitis, as observed in our series of patients.

In our series, all patients had PPW surgical violation and RT treatment. Similarly, one case reported by Cheung *et al*⁷ developed ORN and OM of the subaxial spine following a perforated nasopharyngeal wall. Ng *et al*⁹ also presented a case in which the patient rapidly developed ORN and OM following PPW surgery, RT and PPW ulceration.

Positive culture growth confirms the diagnosis of OM, but may not always be observed owing to the administration of antibiotics

Figure 2. A 53-year-old female (Patient 1) with osteomyelitis (OM) and discitis, axial fused positron emission tomography (PET)/CT and CT correlate (a, b), sagittal fused PET/CT (c) and sagittal post-gadolinium fat suppressed T_1 weighted MRI (d) images. The axial PET/CT images (a, b) demonstrate diffuse soft-tissue prominence of the posterior hypopharyngeal wall with associated abnormal hypermetabolic activity. PET/CT in the sagittal (c) plane reveals abnormal hypermetabolic activity within the C4/C5 disc space and the adjacent posterior pharyngeal wall. (d) The MRI images demonstrate abnormal enhancement within the C4 and C5 vertebral bodies with rim enhancement of the intervening disc space with an associated adjacent epidural abscess.

before tissue culture sampling.¹¹ For example, in the series presented by Cheung et al, which included ORN of the entire cervical vertebral column, only five of ten patients with infection had positive culture growth.⁷

Patient 3 in our series underwent only a single course of conventional EBRT 8 years prior to developing ORN. However, the confounding factor may have been the cutaneous fistula that developed following posterior pharyngectomy for recurrent disease, similar to orocutaneous fistulas that develop following ORN of the mandible.

Since biopsy of the cervical vertebrae is not always technically feasible, accurate radiological exclusion of other differential diagnostic considerations is imperative. ORN has variable imaging appearance and needs to be differentiated from recurrent or metastatic disease, as these require very different management

strategies.⁵ ORN of the cervical spine requires aggressive treatment with antibiotics, hyperbaric oxygen therapy and/or surgery because of the potentially catastrophic neurological and functional consequences of the disease process. Antifungal medications may also be necessary to treat possible candidiasis, as in our Patient 1.

Diagnosis and localization usually depend on imaging. Involvement of the disc space and two adjacent vertebrae are diagnostic for OM and discitis. MRI is known to have high sensitivity and specificity for diagnosis of OM and discitis, which are end stages of ORN of the spine. Typically on MRI, the intervening disc space is of low signal on T_1 weighted and hyperintense on T_2 weighted images with enhancement on administration of contrast.¹³ In three of our four cases, the intervening disc space was of low signal on T_2 weighted imaging. This is likely secondary to devascularization of the disc space from prior radiation treatments. The fourth patient who had typical high signal on T_2

Table 3. Review of reported cases of sub-axial cervical spine osteoradionecrosis (ORN) in the literature

Case	Cancer site	Number of head and neck recurrences	Radiation dose (Gy)	Radiation type	Technique	CCRT	Time interval to ORN	ORN site	Imaging findings	ORN symptoms	ORN treatment	Reference
1	Posterior pharyngeal wall	0	45 out of 70	EBRT	3DcRT	No	5 weeks	C3–C4	Disc space narrowing and vertebral body enhancement, epidural disease, PPW ulceration	Neck pain	i.v. antibiotics, corpectomy, fibular flap	Ng <i>et al</i> ⁹
2	Unknown primary	0	Post-operative 80	EBRT	2DRT	No	25 years	C6–C7	Disc space narrowing and vertebral body enhancement, epidural abscess and cord compression, kyphosis	Neck pain, difficulty extending neck, upper ext. paraesthesia	Corpectomy, fibular flap	Donovan <i>et al</i> ⁸
3	Supraglottic larynx	0	Post-operative 59.4	EBRT	3DcRT	No	10 months	C5–C7	Disc space obliteration, cord compression, collapse of C5–C7 vertebrae, kyphosis, epidural abscess	Difficulty breathing from stoma, bowel and bladder incontinence with ext. weakness	Corpectomy, fibular flap	Donovan <i>et al</i> ⁸
4	Larynx	0	Post-operative 66	EBRT	2DRT	No	15 years	C4–C5	Compression of C5, C4–C6 disc space narrowing, epidural abscess, cord compression,	Neck and shoulder pain, quadriplegia	i.v. antibiotics, exploration	van Wyk <i>et al</i> ¹⁰
5	Posterior hypopharyngeal wall	0	Hyperfractionation 76.8	EBRT	2DRT	Doxetaxol	30 months	C4–C6	Epidural abscess, cord compression, kyphosis, C4–C5 disc space narrowing and vertebral body enhancement	Difficulty swallowing, ascending paralysis	Laminectomy, antibiotics	Kosaka <i>et al</i> ¹¹
6	Pyiform sinus	0	50 (upper oesophageal cancer), 40 (pyiform sinus)	EBRT	3DcRT	Cisplatin	27 months	C4–C6	Disc collapse narrowing, vertebral body enhancement	Upper ext. neuropathy	i.v. antibiotics	Kosaka <i>et al</i> ¹¹
7	Tonsil	0	70	EBRT	IMRT	Cisplatin	15 months	C4–T1	Disc space narrowing	Neck pain, dysphagia, fatigue	Halo fixation, i.v. antibiotics, decompression	Smith and Lentsch ¹²
8	Nasopharyngeal	1	120 (60 × 2)	EBRT	2DRT	N/A	1 year	C4–C5	Disc space narrowing	Incidental finding on X-ray	Antibiotics	Cheung <i>et al</i> ⁷
9	Nasopharyngeal	1	120 (60 × 2)	EBRT	2DRT	N/A	2 years	C2–C3	Disc space narrowing	Neck pain	Clindamycin	Cheung <i>et al</i> ⁷
10	Nasopharyngeal	1	136 (68 × 2)	EBRT	2DRT	N/A	1 year	C7	Disc space narrowing	Neck pain	Conservative	Cheung <i>et al</i> ⁷
11	Nasopharyngeal	0	60	EBRT	2DRT	N/A	17 years	C2–C4	Disc space narrowing	Incidental finding on MRI	Spinal fusion, SCM flap, i.v. antibiotics	Cheung <i>et al</i> ⁷
12	Nasopharyngeal	0	60	EBRT	2DRT	N/A	11 years	C5–C6	Disc space narrowing	Left C5–C6 weakness	Spinal fusion	Cheung <i>et al</i> ⁷

2DRT, two-dimensional conformal radiation therapy; 3DcRT, three-dimensional conformal radiation therapy; CCRT, concomitant chemotherapy; IMRT, intensity-modulated radiation therapy; i.v., intravenous; N/A: not available; PPW, posterior pharyngeal wall; SCM, sternocleidomastoid.

weighted imaging of the disc space had received a one-time high dose of radiation treatment, unlike the other three patients who had multiple radiation treatments, and hence less aggressive devascularization of the end plate. Similarly, Alhilali et al⁴ suggest that bony sclerosis is a useful imaging feature on CT for differentiating ORN from recurrent tumour in the mandible, as it was seen exclusively in cases of ORN.

In all of our cases, the disc space was involved in addition to the adjacent vertebrae. These are typical findings seen in infection, which affect the more avascular disc space before involving the adjacent vertebrae. This imaging appearance is typical for discitis but not for metastatic disease, which primarily involves the more highly vascularized vertebral body. Furthermore, all the cases showed contiguous involvement of the adjacent vertebrae and the intervertebral disc space, which is again more typical for an infection than for metastatic bone disease. Metastatic bone disease typically has more skip and non-contiguous segmental involvement.⁵

Additionally, all of our cases had epidural abscesses. This may be secondary to advanced stage of disease at the time of diagnosis. Five cases in the literature also reported the presence of epidural disease, and this feature was not addressed in the remainder of cases (Table 3). This finding highlights potential delays in diagnosis, most likely owing to the history of head and neck malignancy and a lack of awareness of the otolaryngologist of this potential complication.

Hypermetabolism at the site of prior surgery in a patient with prior history of head and neck cancer is more commonly interpreted as recurrent disease rather than a less common cause of infection. Although recurrent/metastatic disease generally demonstrates higher SUVs than does ORN, significant overlap in the ranges of observed SUVs in individual cases renders PET imaging unreliable in differentiating ORN from malignancy.⁴ In our experience, PET/CT imaging lacks specificity in the

identification of ORN in the spine. In both of our cases where PET/CT was performed, the studies were initially misinterpreted as recurrent disease. One of the pitfalls that we encountered in the interpretation of PET/CT was the lack of the provided history of neck pain. An additional pitfall that was noticed by the experienced neuroradiologists and nuclear medicine specialists is that the initial interpretation PET/CT imaging is performed in the axial plane rather than in the sagittal plane that is typically used for interpretation of MRI for OM and discitis. Interpretation in the axial plane makes it difficult to appreciate extension of hypermetabolic activity into the disc space or vertebrae, which is pathognomonic for discitis. One case was confirmed as OM and discitis following MRI and after intraoperative exploration. The second case was confirmed on MRI and following resolution of findings after 6 weeks of antibiotic treatment. It is therefore important for PET/CT interpreters to be aware of this potential imaging pitfall.

CONCLUSION

ORN has variable imaging appearance and needs to be differentiated from recurrent or metastatic disease. The development of OM and discitis is the end-stage manifestation of ORN in the subaxial spine. The setting of prior RT treatment combined with previous surgical intervention at the PPW puts patients at increased risk of OM and discitis of the subaxial spine. Early intervention for this serious complication of treatments for head and neck cancers may limit the morbidities and potential mortality associated with it. It is therefore important for the radiologist to be aware of the risks for ORN of the cervical spine and its imaging appearance in order to diagnose it accurately. MRI and PET/CT imaging are complimentary in this setting. However, PET/CT images may lack specificity and be prone to misinterpretation, especially in view of the history of head and neck cancer. Therefore, MRI should be utilized for definitive diagnosis of ORN of the cervical spine with associated OM and discitis.

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