

The Journal of Laryngology & Otology

<http://journals.cambridge.org/JLO>

Additional services for *The Journal of Laryngology & Otology*:

Email alerts: [Click here](#)

Subscriptions: [Click here](#)

Commercial reprints: [Click here](#)

Terms of use : [Click here](#)



Rhinologic changes in Wegener's granulomatosis

Glyn Lloyd, Valerie J. Lund, Tim Beale and David Howard

The Journal of Laryngology & Otology / Volume 116 / Issue 07 / July 2002, pp 565 - 569
DOI: 10.1258/002221502760132737, Published online: 08 March 2006

Link to this article: http://journals.cambridge.org/abstract_S002221510200172X

How to cite this article:

Glyn Lloyd, Valerie J. Lund, Tim Beale and David Howard (2002). Rhinologic changes in Wegener's granulomatosis. The Journal of Laryngology & Otology, 116, pp 565-569 doi:10.1258/002221502760132737

Request Permissions : [Click here](#)

Radiology in Focus

Rhinologic changes in Wegener's granulomatosis

GLYN LLOYD, D.M., F.R.C.R., F.R.C.OPTH., VALERIE J. LUND, M.S., F.R.C.S., F.R.C.S.(Ed.),
TIM BEALE, F.R.C.S., F.R.C.R., DAVID HOWARD, F.R.C.S., F.R.C.S.(Ed.)

Abstract

Twenty-eight patients with a clinical diagnosis of sinonasal Wegener's granulomatosis were referred for imaging during the period 1990–2001. Of these, 10 had clinical symptoms and signs confined to the nose and sinuses and 18 had classical systemic Wegener's. The computed tomography (CT) and magnetic resonance (MRI) scans of the series were reviewed by a panel of one otolaryngologist and two radiologists. From the total of 28 patients, 85.7 per cent showed non-specific mucosal thickening in the nasal cavity or paranasal sinuses, 75 per cent showed evidence of bone destruction, and 50 per cent new bone formation in the walls of the sinus cavities. In addition the orbit was affected in 30 per cent of patients.

The diagnosis of systemic Wegener's granulomatosis is made clinically but the condition may present characteristic features on imaging by CT and MRI. In a patient without a history of previous sinonasal surgery, a combination of bone destruction and new bone formation on CT is virtually diagnostic of Wegener's especially when accompanied on MRI by a fat signal from the sclerotic sinus wall. These changes are important diagnostically in localized sinonasal Wegener's granulomatosis where the clinical diagnosis may be uncertain and the cANCA test can be negative.

Key words: Wegeners Granulomatosis; Tomography, X-Ray Computed; Magnetic Resonance Imaging

Introduction

Wegener's granulomatosis was first described by Klinger¹ in 1932 and subsequently by Wegener² in 1936 who established the classical triad of a necrotizing vasculitis of the upper and lower respiratory tracts, a systemic vasculitis, and focal necrotizing glomerulo-nephritis. The concept of a localized form of pulmonary Wegener's was introduced in 1966 by Carrington and Liebow.³ Their views were subsequently supported by Casson *et al.* in 1970.⁴ A limited form of Wegener's granuloma has also been described in the upper respiratory tract^{5–7} presenting as a mid-line destructive lesion of the nose and sinuses and, in 1990, Boudes⁸ described a purely granulomatous form of the localized disease. He postulated a three-stage process: the first stage an acquired granulomatous disease; the second stage corresponding to the limited form of Wegener's and characterized by a granulomatous vasculitis; and a third stage of general vasculitis and systemic Wegener's.

The diagnosis of sinonasal Wegener's granuloma is based on the clinical findings and a positive cANCA test or PR3. The results of biopsy are rarely diagnostic and often inconclusive, and the cANCA lacks sensitivity in the limited form of the disease⁸ or following systemic steroids. Imaging studies, principally CT scan, may present characteristic features of Wegener's and can be helpful in establishing the diagnosis, in addition to showing the extent of the disease.

In this study we examined the imaging features of Wegener's granulomatosis in both its systemic and localized forms.

Materials and methods

The available CT and MR scans of the nose and sinuses of 28 patients who had been referred to the Imaging Department with a clinical diagnosis of Wegener's granuloma were reviewed. All 28 patients had undergone single or multiple CT examinations and seven had had an additional MRI. These patients showed an equal sex distribution and an average age of 44.1 years (age range 15–79). All scans were reviewed retrospectively by two radiologists and an otolaryngologist.

Results

Computerized tomography

From the total of 28 patients, 18 were classified as systemic Wegener's and 10 showed changes limited to the nose and sinuses. From the overall total of 28 patients, 24 (85.7 per cent) showed non-specific mucosal thickening in the nasal cavity or paranasal sinuses or other evidence of infection such as a fluid level; 21 (75 per cent) showed evidence of bone destruction and 14 (50 per cent) increased density in the walls of the sinuses. In eight (28.6 per cent) patients there was a soft tissue mass in the orbit (four bilateral), and in three this was associated with a soft tissue mass in the

TABLE I
CHANGES ON IMAGING ASSOCIATED WITH WEGENER'S GRANULOMATOSIS (n = 28)

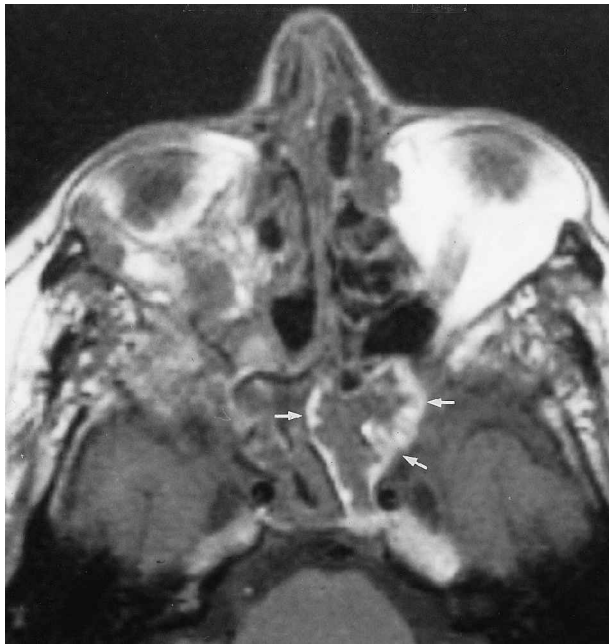
(n)	Mucosal changes	Bone destruction	Bone sclerosis	Orbital mass
Systemic Wegener's (18)	83%	77%	55%	33%
Localized Wegener's (10)	80%	75%	40%	30%

adjacent ethmoids. However, four patients (three with systemic disease and one with localized nasal change) had scans, which were almost normal, with minimal mucosal

thickening. As can be seen in Table I there was little difference between the incidence of positive CT findings in the localized and in the systemic forms of the disease.



(a)



(b)

FIG. 1

Wegener's granuloma. (a) Axial CT scan showing new bone formation in the left sphenoid sinus (arrows). (b) Axial magnetic resonance scan of the same patient. The T1-weighted spin echo sequence shows strong fat signal from the new bone formation (arrows). The signal was removed by fat suppression.

Magnetic resonance imaging

In the series seven patients were investigated by MRI. Of these, five showed a high signal from the lining membrane in the areas affected by Wegener's granuloma. This non-specific sign was noted originally in 1987⁹ and has been recorded more recently by Muhle *et al.*¹⁰ These authors also reported granulomas depicted as low signal intensity lesions on T1- and T2-weighted spin echo sequences in the paranasal sinuses and orbit and this was confirmed in two patients with orbital invasion in this series. The patients receiving contrast medium showed increased enhancement of signal from the lining membrane of the affected nose and sinus cavities, and one patient in the non-systemic



(a)



(b)

FIG. 2

Same patient as Figure 1 (a) Typical new bone formation affecting the bony wall of the lateral recess of the right antrum (arrows). (b) T1-weighted MRI of the same area shows fat signal (arrows).

group was shown to have a strongly enhanced tumour-like mass in the ethmoids and orbit.

An important MR finding was recorded in two patients who showed increased bone density on CT. This consisted of high signal on T1-weighted sequences from the wall of the sinuses affected by new bone formation. The high signal was abolished by fat suppression and almost certainly represents fat between the sinus wall and a new line of corticated bone on its inner surface (Figures 1 and 2).

Discussion

By virtue of their referral, all patients in this series had upper respiratory tract symptoms, predominantly affecting the nose. In the respiratory tract the typical histopathological lesion of Wegener's granulomatosis is a necrotizing vasculitis, which takes the form of fibrinoid necrosis affecting the walls of the small to medium arteries and veins.¹¹ The wall damage is accompanied by acute or chronic inflammatory cell infiltrate within the vessel wall or the presence of large epithelioid granulomas with obliteration of adjacent small arteries. The resulting avascular necrosis accounts for the bone destruction which is the most striking change on CT and is seen against a background of generalized mucosal thickening in the

nose and sinuses. The destructive process is located initially in the mid-line, affecting the septum and turbinates and typically spreads symmetrically to involve the antra and then the rest of the sinuses. The end result is a large single cavity with disappearance of the antral walls, the ethmoid septa, laminae papyracea and cribriform plate, but characteristically sparing the hard palate. This process is illustrated sequentially in Figures 3-6. Asymmetric bone destruction, confined to one side of the nasal cavity is unusual and was seen in three patients only.

In addition to bone destruction, 50 per cent of the patients showed sclerotic changes in the walls of the affected sinuses. This presents a distinctive appearance on CT and may also be recognized on MRI. Using bone windowing the sclerotic change is seen as a slightly irregular double line to the sinus wall, made up of a new corticated edge inside the normal bone, and separated by an area of less dense bone (Figure 7).

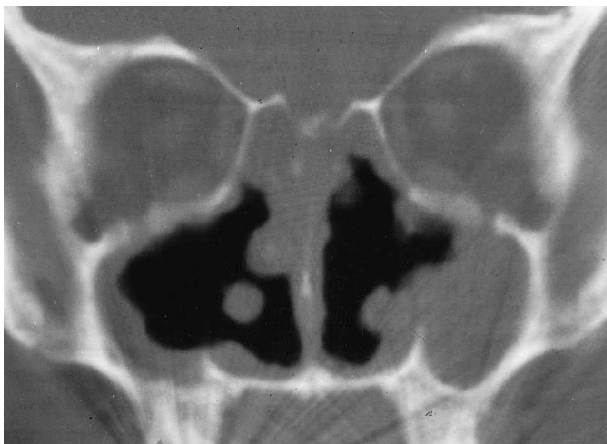
On MRI this area may give a high signal on T1-weighted sequences (see above) (Figures 1 and 2) and must represent fat in cancellous bone presumably the result of bone marrow deposition. These features suggest a neo-osteogenesis rather than a periostitis, and the change is particularly well seen in the antra. On CT a similar appearance may present following surgery, particularly



(3)



(5)



(4)



(6)

FIG. 3-6

Wegener's granuloma: Series of coronal CT sections of the same patient over a period of six years showing progressive bone destruction in the nose and sinuses in the absence of any surgery. Figure 3 (1994); Figure 4 (1995); Figure 5 (1997); Figure 6 (2001).



FIG. 7

Axial CT section. Sclerosis of the sinus wall in Wegener's granuloma. The new bone formation is seen as a slightly irregular double line to the sinus wall, made up of a new corticated edge inside the normal bone (arrows), and separated by an area of less dense bone.

after the Caldwell Luc procedure, but in the absence of any previous surgery a combination of an antral cavity with an eroded medial wall, thickened lining membrane and a double line of new bone formation in the sinus wall, is diagnostic of sinonasal Wegener's (Figure 8). In some patients the process may extend to partial or complete obliteration of the sinus cavity.²

In 30 per cent of the patients, in addition to sinus disease, there was unilateral or bilateral invasion of the orbit by an infiltrative process; in total 12 orbits were involved, with nine having the whole of the orbit affected, and typically causing complete obliteration of the normal retrobulbar anatomy on CT. There was one example of punctate calcification within the bilateral infiltration. In three orbits the invasion was incomplete, the orbital infiltration resembling a so-called orbital 'pseudotumour' on CT, and it has been suggested⁸ that the granulomatous form of Wegener's may present in the orbit as this entity. In line with this concept Provenzale *et al.*¹³ recorded five patients with orbital Wegener's without sinus disease.

A problem in diagnosis arises in localized Wegener's granuloma because the cANCA test lacks sensitivity in this form of the disease. If patients with a positive cANCA in this group may be confidently diagnosed as Wegener's granuloma, cANCA negative patients remain a diagnostic challenge especially when the results of biopsy are inconclusive. It is in this group that CT and MRI may be diagnostic if the characteristic changes of Wegener's granuloma are demonstrated. In the present series there are 10 patients with changes limited to the nose and sinuses; five with positive cANCA, and five negative. All had markedly friable nasal mucosa with crusting and bleeding on endoscopic examination, significantly raised ESR and/or CRP and felt generally unwell. One patient in the negative group is a recent case with a non-specific biopsy and CT changes compatible with Wegener's but as yet without a firm diagnosis. Of the remaining four patients, three showed a combination of bone destruction and sclerosis typical of Wegener's, while a fourth patient showed massive bone destruction similar to the end stage of the disease illustrated in Figure 6. From their long histories (average over 10 years), and the non-specific inflammatory changes shown by biopsy, it seems unlikely that any of this group could be a malignant lymphoma (see below); and the similarity of the imaging changes in the



FIG. 8

Axial CT of the left maxillary antrum showing typical changes of Wegener's granuloma. Opaque antral cavity with destruction of the medial wall, and characteristic double line of new bone formation affecting the lateral and anterior wall.

systemic and localized forms of the condition (Table I) suggests that they all represent a spectrum of a single disease process.

Whilst the majority of these patients had significant changes on sinonasal imaging, it is noteworthy that in four, three of whom had significant systemic disease and had been referred by chest and renal physicians, the scans were virtually normal. The absence of abnormalities on the scan therefore should not lull the ENT surgeon into a false sense of security.

Differential diagnosis

Of major importance in the differential diagnosis of localized sinonasal Wegener's is nasal T-cell lymphoma, a condition which may present with mid-line facial destruction.¹⁴ The tumour has two histological types: one is a peripheral T-cell lymphoma with monomorphic cell proliferation, the other is a polymorphic reticulosis characteristic of the angiocentric natural killer T-cell lymphoma, a distinct entity that is strongly associated with the Epstein-Barr virus. The tumour is the predominant variety of T-cell lymphoma, and gives rise to an angio-invasion by tumour cells producing an avascular necrosis resulting in changes in the nose and sinuses, that may resemble those seen in Wegener's granuloma. Some lesions remain isolated in the nose and mid-line structures for prolonged periods¹⁵ resulting in local tissue destruction. The disease is common in Asia and South and Central America but rare in Europe and the US.¹⁶ Histologically the characteristic feature is a polymorphic reticulosis¹⁷ and the tumour expresses the neural adhesion molecule CD56, but differentiation may not always be possible on routine biopsy, and the diagnosis is made by the demonstration of Epstein-Barr virus RNA in cell nuclei (in situ hybridization test). In virtually all cases of NK/T-cell lymphoma this test

is positive;¹⁸ by contrast the test is negative in Wegener's granulomatosis.

The other granulomatous condition that may mimic localized Wegener's clinically is sinonasal sarcoid. When the nasal bones are involved, sarcoid produces a characteristic wide-meshed trabecular pattern due to the presence of granulomata within the bone. The changes within the nasal cavity and paranasal sinuses are less definite and non-specific. The nasal mucosa of the septum and inferior turbinates is most commonly involved and the imaging changes are usually limited to mucosal thickening or opacity of one or more sinuses, sometimes with a soft tissue mass. Bone destruction is also reported,^{19,20} and the presentation may then resemble the limited form of cANCA negative Wegener's both clinically and on CT.²¹ However, the latter authors, in a review of the literature, found no instance of sinonasal bone destruction without evidence of pulmonary sarcoid; in these circumstances a chest X-ray, which is routine in suspected Wegener's, should indicate the diagnosis.

Conclusion

The diagnosis of systemic Wegener's is made clinically, but the condition often presents characteristic features on imaging by CT and MRI. In a patient without a history of nose or sinus surgery, a combination of bone destruction and new bone formation on CT is virtually diagnostic, especially when supported on MRI by the demonstration of a fat signal from the sclerotic sinus wall. These changes become important diagnostically in patients with the non-systemic, localized form of Wegener's, a group where the clinical diagnosis is often uncertain and the cANCA test may give false negative results.

References

- Klinger H. Grenzformen der Periarthritis Nodosa. *Z Pathol* 1932;**42**:455-80
- Wegener F. Über generalisierte septische. *Gefasserkrankungen Verh Dtsch pathol Ges* 1936;**29**:202-12
- Carrington CB, Liebow AA. Limited forms of angitis and granulomatosis of Wegener's type. *Am J Med* 1966;**41**:497-527
- Cassan J, Coles DT, Harrison EG. The concept of a limited form of Wegener's granulomatosis. *Am J Med* 1970;**49**:366-79
- McDonald TJ, De Remee RA, Kern EB, Harrison EG. Nasal manifestations of Wegener's granuloma. *Laryngoscope* 1974;**84**:2101-12
- Duncavage JD, Durkin JD, Lennan RH, Toohill RJ. Dilemmas in the management of chronic nasal and sinus inflammatory disease of unknown aetiology. *Laryngoscope* 1985;**95**:1178-83
- Ahmad I, Lee WC, Nagendran V, Wilson F, Shortridge RT. Wegener's granulomatosis in otolaryngology: a review of six cases. *ORL* 2000;**62**:149-55
- Boudes P. New concept for an old disease. *Semin Arthritis Rheum* 1990;**19**:365-70
- Lloyd GAS, Lund VJ, Phelps PD, Howard DJ. Magnetic resonance imaging in the evaluation of nose and paranasal sinus disease. *Brit J Radiology* 1987;**60**:959-68
- Muhle C, Reinhold-Keller E, Richtig C, Duncker G, Beigel A, Brinkmann G, et al. MRI of the nasal cavity, paranasal sinuses and orbits in Wegener's granulomatosis. *Eur J Radiol* 1997;**7**:566-70
- O'Devaney K, Ferlito A, Hunter BC, Devaney SL, Rinaldo A. Wegener's granulomatosis of the head and neck. *Ann Otol Rhinol Laryngol* 1998;**107**:439-45
- Paling MR, Roberts RL, Fauci AS. Paranasal sinus obliteration in Wegener's granulomatosis. *Radiology* 1982;**144**:539-43
- Provenzale JM, Allen NB. Wegener's granulomatosis: CT and MR findings. *Am J Neuroradiol* 1996;**17**:785-92
- Jaffe ES, Chan JKC, Su IJ, Frizzera G, Mori S, Feller AC, et al. Report on the workshop on nasal and related extranodal angiocentric T/natural killer cell lymphoma. *Am J Surg Pathol* 1996;**20**:103-11
- Cuadra-Garcia I, Proulx GM, Wu CL, Wang CC, Pilch BZ, Harris NL, et al. Sinonasal lymphoma: a clinico-pathologic analysis of 58 cases from the Massachusetts General Hospital. *Am J Surg Pathol* 1999;**23**:1356-69
- Gaal K, Sun NC, Hernandez AM, Arber DA. Sinonasal natural killer/T cell lymphoma in the US. *Am J Surg Pathol* 2000;**24**:1511-7
- Tomita Y, Ohsawa M, Qiu K, Hashimoto M, Yang WI. Epstein-Barr virus in lymphoproliferative diseases in the sinonasal region. *Int J Cancer* 1997;**70**:9-13
- Dictor M, Cervin A, Kalm O, Rambech E. Sinonasal T cell lymphoma in the differential diagnosis of lethal midline granuloma using in situ hybridisation for Epstein-Barr virus RNA. *Mod Pathol* 1996;**9**:7-14
- Brodley JE, Proctor DF. Destructive lesion in the paranasal sinuses associated with Boeck's sarcoid. *Arch Otolaryngol Head Neck Surg* 1942;**36**:740-2
- Dodd GD, Jing BS. *Radiology of the Nose, Paranasal Sinuses and Nasopharynx*. Baltimore: Williams and Wilkins, 1977
- Hasni SA, Gruber BL. Sarcoidosis presenting as necrotising sinus destruction mimicking Wegener's granulomatosis. *J Rheumatol* 2000;**27**:512-4

Address for correspondence:

Professor V. J. Lund,
Institute of Laryngology and Otology,
University College London,
330 Gray's Inn Road,
London WC1X 8DA, UK.

Fax: +44 171 833 948

Professor V. Lund takes responsibility for the integrity of the content of the paper.

Competing interests: None declared