

# Immunoglobulin G4-Related Aortitis of the Abdominal Aorta

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Noninfectious aortitis, inflammatory abdominal periaortitis, and idiopathic retroperitoneal fibrosis are chronic inflammatory diseases with unclear causes. Recent studies have shown that some cases of aortitis are associated with immunoglobulin G4 (IgG4)-related systemic disease. Herein, we report a case of IgG4-related aortitis (IgG4-RA) that was diagnosed after surgery. Our patient was a 46-year-old man who had experienced abdominal pain for several weeks. Preoperative evaluations revealed an area of aortitis on the infrarenal aorta. He underwent surgery, and histological examination resulted in a diagnosis of IgG4-RA.

**Key words:** 1. Aortitis  
2. Arteritis  
3. Retroperitoneal fibrosis

## Case report

A 46-year-old man visited Gyeongsang National University Hospital with abdominal pain in the periumbilical area that had lasted for 5 weeks. He had no other medical history. On examination, he presented normal vital signs and had no localized signs of infection. Laboratory tests showed 8,710 leukocytes/mm<sup>3</sup> with the normal formula, a C-reactive protein level of 15.8 mg/L, and an erythrocyte sedimentation rate of 40 mm/hr. Coagulation, hepatic enzymes, and summary urinalysis findings were normal. A chest radiograph showed no pulmonary or mediastinal abnormal lesions. Blood culture and urine culture were sterile. We investigated immunological causes, including anti-double stranded DNA antibody, anti-beta-2 glycoprotein 1 immunoglobulin G (IgG),

lupus anticoagulant, anti-cardiolipin IgG and immunoglobulin M (IgM), fluorescent treponemal antibody absorption IgG and IgM, anti-neutrophil cytoplasmic antibody, and human leukocyte antigen-B51; all findings were negative. Computed tomography (CT) of the abdomen was performed to confirm the cause of abdominal pain, and no other abnormal finding was found except a diffuse infrarenal aortic wall thickening (14 mm), with homogeneous enhancement and mild aortic lumen stenosis (Fig. 1). Aortic angiographic CT was taken to assess the condition of the ascending aorta and aortic arch, and there were no abnormal findings. Based on these findings, we suspected aortitis and performed surgery to obtain a biopsy to assess this possibility. We identified an irregularly-shaped area of solid chronic inflammatory tissue surrounding the aorta, with no

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signs of acute infection (Fig. 2A). We removed the tissue surrounding the anterior wall and lateral wall of the aorta and confirmed the restoration of aortic size (Fig. 2B). On a low-power histologic image of a hematoxylin and eosin-stained section of periaortic soft tissue, diffuse inflammatory infiltration and irregular fibrosis were noted (Fig. 3A). In an immunohistochemical assessment, IgG-positive plasma cells were observed in the fibrous tissue (Fig. 3B), and IgG4-positive plasma cells were identified in the periaortic tissue (Fig. 3C). The ratio of IgG4- to IgG-positive cells was 40%, and the patient was diagnosed with IgG4-related aortitis (RA). On hospital day 15, the patient began glucocorticoid treatment for the remaining inflammatory tissue of the aorta and discharged.

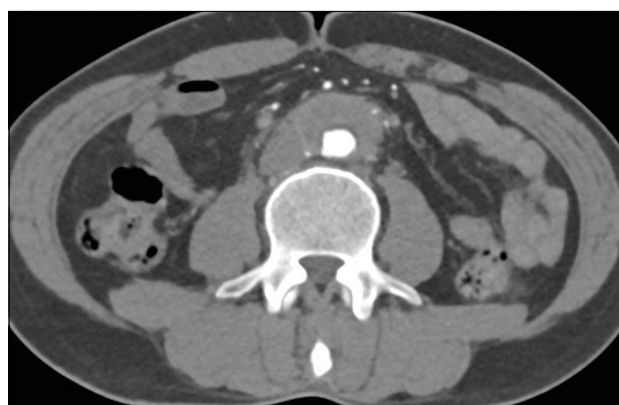


Fig. 1. Computed tomography showing diffuse infrarenal aortic wall thickening (14 mm), with homogeneous enhancement and mild aortic lumen stenosis.

The patient provided written informed consent for publication of clinical details and images.

## Discussion

Aortitis is an inflammatory disease of the aortic wall, with various etiologies that are not all well-understood. Because of the variety of causes, it may be difficult to pinpoint the cause of aortitis before starting treatment [1]. Aortitis is divided into infectious causes and non-infectious causes. Bacteria such as *Staphylococcus* and *Salmonella* are the main causes of infectious aortitis, although tuberculosis, syphilis, or virus that cause inflammation in humans can also be causes [1]. The major causes of non-infectious aortitis are connective tissue disorders, trauma, and neoplasms, but this category also includes IgG4-RA [2]. IgG4-RA is a newly recognized systemic inflammatory disease that must be carefully distinguished from neoplasms [2,3]. Histologically, IgG4-RA has the following characteristics: thickening of the aortic wall, a lymphoplasmacytic infiltrate enriched in IgG4-positive plasma cells, and a variable degree of periaortic fibrosis referred to as a 'storiform pattern' [3]. Most cases of IgG4-RA are diagnosed based on histological findings after surgery, as in the case of our patient.

The diagnosis of IgG4-RA requires biopsy of the affected tissues, but it might be suspected based on routine laboratory tests and selected imaging tests. Inoue et al. [4] described the CT findings associated with IgG4-RA in 17 patients. In all cases, the aortic wall was severely thickened, with an average max-

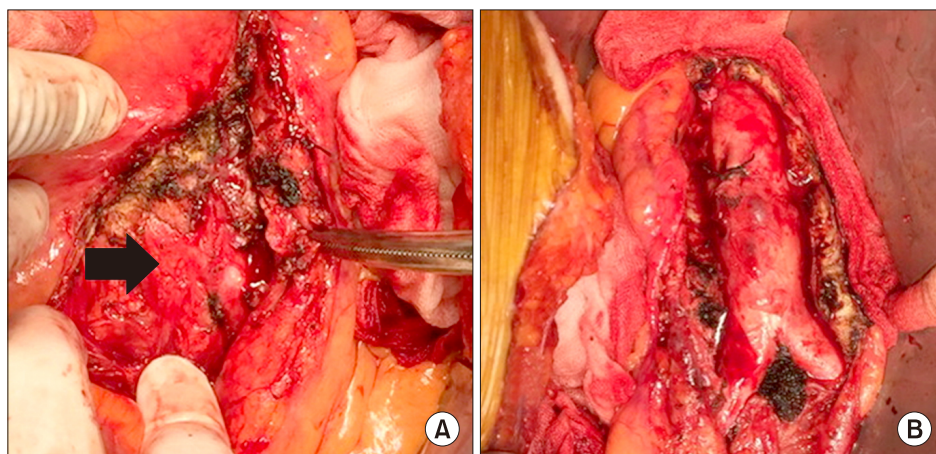
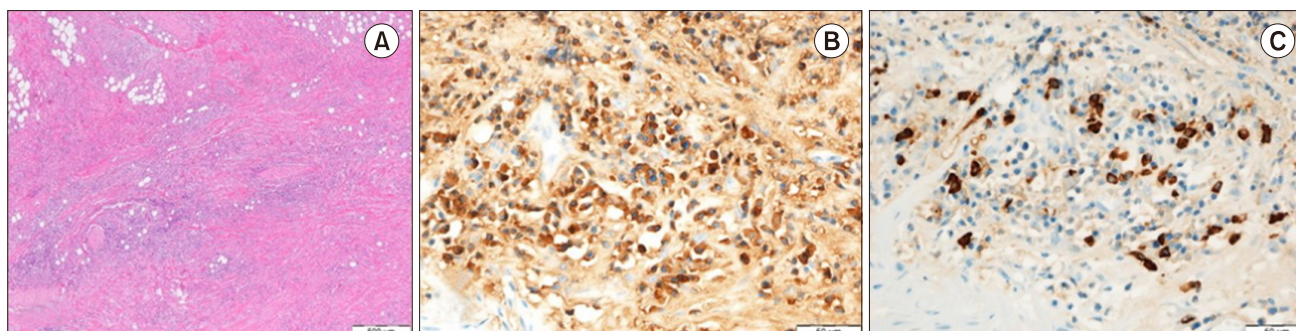


Fig. 2. Intraoperative finding. (A) An irregularly-shaped area of solid chronic inflammatory tissue surrounding the aorta (black arrow). (B) Restoration of the aortic size after removal of periaortic tissue.



**Fig. 3.** (A) A low-power histologic image of a hematoxylin and eosin-stained section of periaortic soft tissue. Diffuse inflammatory infiltration (bluish area) and irregular fibrosis (pinkish area) are noted ( $\times 40$ ). (B) Immunohistochemistry showing IgG-positive plasma cells in fibrous tissue ( $\times 400$ ). (C) Immunohistochemistry showing numerous IgG4-positive plasma cells ( $\times 400$ ). IgG, immunoglobulin G.

imum thickness of 5–22 mm (mean, 11 mm) [4]. All lesions were homogeneously enhanced in the late phase of contrast-enhanced CT and 19 of 22 (86%) were well-circumscribed [4]. Cystic change, calcification, or lymph node enlargement was not detected in any lesions [4]. Our patient showed similar findings; the aortic wall thickness was 14 mm, and the lesions were homogeneously enhanced in the late phase and well-circumscribed. Cystic change, calcification, or lymph node enlargement was not detected. It is also helpful to measure serum IgG4 levels to diagnose IgG4-RA. Serum IgG4 levels were above the normal upper limit in 86% of the 114 patients in a previous study [5]. The degree of elevation of IgG4 is not perfectly associated with the extent of disease activity, but the serum IgG4 concentration tends to increase with the number of involved organs and generally decreases after glucocorticoid therapy [6]. Unfortunately, we did not suspect IgG4-RA before surgery and did not measure the patient's preoperative IgG levels. Nonetheless, our patient's initial IgG4 level after surgery was 1,520 mg/dL (normal, 8–140 mg/dL), and we will follow up further changes in his IgG4 levels.

No optimal treatment for IgG4-RA has been established. Kasashima and Zen [7] suggested that glucocorticoid therapy ultimately will not control the disease, and long-term glucocorticoid toxicity may pose risks, such as increasing the likelihood for aortic aneurysm rupture. However, some points of consensus among experts do exist. All patients with symptomatic active IgG4-RA require treatment [8]. Glucocorticoids are the first-line treatment in all patients with untreated active IgG4-RA, except when treatment is contraindicated [8]. We have started the

patient on glucocorticoid treatment, and we plan to follow the effects thereof in the future.

In conclusion, although IgG4-RA is rare, clinicians should keep in mind that aortitis could be associated with IgG4-related systemic disease. In addition, large-scale prospective studies are needed to confirm the efficacy and safety of corticosteroid therapy and to design more useful and safe treatment strategies.

### Conflict of interest

No potential conflict of interest relevant to this article was reported.

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