Intestinal angioedema is a rare side effect of the angiotensin converting enzyme (ACE) inhibitor, used in arterial hypertension and congestive heart failure treatment. ACE inhibitor induced small bowel angioedema is a self-limited condition that presents with sudden acute or recurrent abdominal pain, nausea and vomiting. Only a few cases have been reported in literature (1-3).

Case report

A 36-year-old female was admitted to the emergency department with a 24-hours history of nausea, vomiting and moderate diffuse abdominal pain. She denied diarrhea, constipation or blood in stools, as well as recent seafood ingestion. During physical examination, no fever or signs of abdominal rebound were found. The lab tests only showed mild leukocytosis $16,4 \times 10^9/L$, with slight neutrophilia ($8 \times 10^9/L$). Serology and stool cultures were negative. She had a history of hypertension treated with enalapril for two years and was taking oral contraception. Abdominal ultrasound revealed straightening and circumferential mural thickening of some small bowel loops, with very hypoechoic submucosa and folds swelling (Fig. 1). Some of these loops were distended with fluid. A moderate volume of homogeneous ascites was present in all abdominal quadrants (Fig. 1). No mesenteric adenopathy nor increased echogenicity of mesenteric fat were found. During the examination the patient denied pain with probe compression.

Contrast enhanced CT, performed 4 hours later, confirmed concentric wall thickening of at least four continuous loops of jejunum, two of these appearing straightened (Fig. 2). These loops also showed the so-called “target-sign”, a wall stratification comprising mucosal...
thickening and straightening or asci-
tates) and the patient’s symptoms (2,
5). In this case, the ascites and the
markedly thickened, straightened
and hypoechoic bowel loops, that
were almost painless under probe
compression, raised a strong diag-
nostic suspicion.
When this condition is identified,
only conservative treatment is pre-
cluded, as IV hydration and pain
control (1, 2, 5). Undiagnosed A
CE inhibitor induced small bowel an-
gioedema can lead to unnecessary
invasive examinations and proce-
dures, including surgery (2, 4-6). Dis-
continuation of ACE inhibitor is man-
datory to prevent recurrence (1, 2, 5).
Differential diagnosis include
hereditary and acquire small bow -
el angioedema, allergic reaction,
infectious gastroenteritis, vasculi-
tis and mesenteric ischemia (6, 7).
Hereditary and acquired (paraneo-
plastic/auto-immune) small bowel
angioedema relate to C1 esterase in-
hibitor deficiency are indistinguish-
able from the drug-induced one (5,
7). However, the hereditary form
has a positive family history in 75%
of the cases and usually presents
in infancy or early adolescence (4).
The acquired form of the disease
is more easily misinterpreted, as it
can be present before the diagnosis
of the predisposing condition (7).
Allergic reaction, especially after
shellfish ingestion, can be ruled out
by absence of history of exposition
to those allergens. Infectious gas-
troenteritis in the absence of fever

Small bowel angioedema associ-
ated with ACE inhibitor can occur at
any adult age, but is more common
in women (1, 2, 4). It usually presents
with sudden acute or recurrent ab-
dominal pain, nausea and vomiting
(2), with onset reported between a
few days and almost a decade after
starting taking angiotensin-convert-
ing enzyme inhibitor (3). Pain can be
severe, mimicking small bowel isch-
emia. Diarrhea and mild leukocytosis
can occur, but small bowel obstruc-
tion and fever are not expected. Usu-
ally symptoms are self-limited and
resolve between 24-36 hours with or
without cessation of ACE inhibitor
(1, 5). Consequently, the rapid onset
and fading of the angioedema give
rise to imaging findings with various
degrees of expression (5).
Common CT findings include:
segmental small bowel wall concen-
tric thickening and the “target” sign
(submucosal marked hypoattenua-
tion between the enhancing mucosa
and serosa); straightening/elonga-
tion of bowel loops (produced by the
nitric oxide, also seen in ultrasound);
mild bowel fluid dilatation; mesen-
teric vessels engorgement; mesen-
teric edema and variable amount of
ascites (1, 3, 5, 6). No vascular com-
promise or adenopathy should be
found.
Ultrasound is especially useful in
slim patients as it permits assess-
ment of bowel motility, which should
be conserved or mildly decreased,
and direct correlation between the
imaging findings (as parietal bowel
thickening and straightening or asci-
tes) and the patient’s symptoms (2,
5). In this case, the ascites and the
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and hypoechoic bowel loops, that
were almost painless under probe
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enhancement, edematous hypoatt-
tenuating submucosa and serosal
enhancement (Fig. 3). The moder-
ate volume of ascites was still pres-
ent (Fig. 3). Mesenteric vessels were
patent. No lymphadenopathy was
identified.
An episode of small bowel an-
gioedema induced by ACE inhibitor
was the final retained diagnosis. The
patient improved spontaneously
with only IV hydration and was dis-
charged after 2 days. The ACE I was
replaced by an angiotensin II recep-
tor blocker (ARB).
A control abdominal ultrasound
performed 6 days later confirmed a
total disappearance of the findings.

Discussion
Angioedema is characterized by
episodes of increased capillary per-
meability and consequent edema of
cutaneous tissues or mucosal tracts.
ACE inactivates bradykinin, which is
an activator of the nitric oxide sys-
tem that produces vasodilatation and
increases vascular permeability.
Inhibition of this cascade in predis-
posed patients leads to angioedema
involving face, tongue and upper re-
spiratory tract (1, 2). The mechanism
for bowel angioedema induced by
ACE inhibitor is not known, although,
as in the upper respiratory tract, it is
usually a very transient condition
with variable degree of severity (1).
Any segment of small bowel can be
affected, however the jejunum is the
most common (1).

Fig. 3. — Enhanced CT axial images: Segmental jejunal wall thickening and stratification (circle) – edematous hypoattenuating
submucosa between mucosal and serosal enhancement – the “target sign”. Moderate volume of ascites in the Morrison space.
and with a great volume of ascites is highly unlikely. Patients with small bowel involvement by vasculitis often show marked vascular engorgement, nonspecific lymphadenopathy and multifocal areas of bowel wall thickening, resulting from intramural edema and haemorrhage secondary to the vasculitis-induced ischemia. Helpful clinical clues may include gastrointestinal bleeding, cutaneous manifestations or a prior diagnosis of vasculitis. Contrast enhanced abdominal CT showing patent mesenteric vessels rules out the hypothesis of mesenteric ischemia.

The number of patients taking ACE inhibitor is high and rising, so it is very important to Radiologists to know and recognize ACE inhibitor induced small bowel angioedema (8). Although this entity is considered a diagnosis of exclusion, in the appropriate clinical setting, the combination of the imaging, clinical and laboratory findings should prompt the hypothesis of this diagnosis (2, 4).

References