CASE REPORTS

Mirror Aneurysm with Right Frontal ICH in a Patient with Osteogenesis Imperfecta

Vijay Sardana¹, Sumit Kamble², Sunil K Sharma², Dilip Maheshwari³, Bharat Bhushan³

Abstract
Osteogenesis imperfecta (OI) is a heterogeneous group of inherited disorders that occur owing to the abnormalities in type 1 collagen, and is characterized by increased bone fragility and other extraskeletal manifestations. OI may be associated with vascular complications such as aortic and cervical artery dissection, carotid cavernous fistula, and coronary artery aneurysms but unlike other connective tissue diseases, the cerebrovascular system is less frequently involved. We report rare case of 50 year female patient who was diagnosed with OI following right frontal haemorrhage secondary to a ruptured middle cerebral artery mirror aneurysm.

Introduction
OI is an inherited connective tissue disorder, caused by abnormalities in type 1 collagen and is characterized by bone fragility and other extraskeletal features, including hearing loss, blue sclera, dentinogenesis imperfecta and hyperlaxity of ligaments and skin. It may lead to a wide range of associated neurologic abnormalities, and may also be associated with cavernous fistulas and dissection of carotid artery, and cerebral aneurysms. It has been reported that the exon 28 polymorphism of collagen type 1 alpha-2 gene (COL1A2) may predispose patients to intracranial aneurysms (IA).¹ In our case, OI was diagnosed following right frontal haemorrhage secondary to a ruptured middle cerebral artery mirror aneurysm.

Case History
A 50 year old female was admitted with acute onset headache since 1 day followed by one episode of generalised tonic clonic convolution and left hemiparesis. On general examination patient had blue sclera (Figure 1), and dentinogenesis imperfecta (Figure 2). Neurologic examination revealed...
Glasgow coma scale 15/15 and mild left hemiparesis, with fundoscopy suggestive of vitreous haemorrhage (Figure 4). Patient also had past history of multiple fractures (thrice) associated with minor trauma before puberty. Family history of blue sclera in daughter (Figure 3), sister and mother was obtained. Clinical diagnosis of OI type 1A was kept.

Patient’s biochemical investigation including coagulation profile and serum bone metabolism markers were normal. Patient CT head showed right frontal hematoma (Figure 5). MR angiography (Figure 6) and cerebral digital subtraction angiography (DSA) showed bilateral M1 MCA bifurcation saccular mirror aneurysms (Figure 7). A series of radiographs showed old healed fracture in right clavicle and diffuse osteopenia (Figure 8). Genomic DNA testing for mutations in COL1A1 and COL1A2 could not be done because of financial limitations.

Patient was managed conservatively and was discharged with advising regarding neurointervention for aneurysm.

Discussion

Osteogenesis imperfecta, with estimated incidence of approximately 1 per 20,000 births, is a genetic disorder affecting the bones, ears, eyes, skin and other structures that contain a substantial amount of type I collagen. Most patients with OI have an autosomal dominant mutation in COL1A1 (located at 17q21.31-q22) or COL1A2 (located at 7q22.1) that affects the structure of one of the two alpha chains of type I collagen; these genes account for approximately 80% of cases of OA. Eight clinico-pathogenetic types share the common feature of bone fragility of which OI type 1, the case we describe, is least severe and commonest variety of OI accounting for approximately 50% of cases. Other well-described clinical features of type 1 OI include blue sclera, conductive hearing loss, ligamentous laxity and rarely dentinogenesis imperfecta. Diagnosis is usually established on the basis of a strong family history of OI or recurrent fractures, fractures occurring in a setting of minimal trauma especially in children, and a prominent scleral bluish hue. There is no definitive, readily available lab test for OI. Sequence analysis of cDNA or genomic DNA testing of white blood cells for mutations in COL1A1 and COL1A2 can detect 90% or more of all collagen type I mutations. With strong positive family history, history of recurrent fractures and blue sclera it can be presumed that this patient is clinically OI, although tests for mutation in the COL1A1 or COL1A2 gene were not done.

A prominent pathologic feature of cerebral artery aneurysms is reduced collagen content. A key feature of vessel wall competence, which is breached in the aneurysm setting, is collagen cross-linking, which affords the vessel tensile strength. OI is commonly associated with mutations for type I collagen genes, possibly causing amount reduction or structural variation which may result in weakening of arterial wall resulting in aneurysm formation. Alternatively vascular dissection may be the dominant pathomechanism of OI-related vascular disease with resultant pseudoaneurysm formation.

Mirror aneurysm are presence of paired or “twin” unruptured intracranial aneurysms located in similar positions bilaterally on the parent arteries. There estimated range is < 5% of all patients with unruptured intracranial aneurysms. According to Casimiro et al, mirror aneurysm are more likely to be unaccompanied by conventional risk factors like hypertension or smokings. Degenerative changes at arterial junction caused by hemodynamic stress on prior weakened vessel wall due to OA may predispose patients to mirror aneurysm at arterial junction. Compared with extracranial arteries of similar size, the internal elastic lamina of intracranial arteries
Table 1: Case reports of IA with OA

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Age, Sex</th>
<th>Location</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petruzzellis M, et al. (2007)</td>
<td>44 M</td>
<td>VA union</td>
<td>Saccular</td>
</tr>
<tr>
<td>Matouk CC, et al. (2011)</td>
<td>49 M</td>
<td>SCA</td>
<td>Dissection</td>
</tr>
<tr>
<td>Kaliaperumal C, et al. (2011)</td>
<td>53 M</td>
<td>VA</td>
<td>Saccular</td>
</tr>
<tr>
<td>Hirohata T et.al.(2014)</td>
<td>37 F</td>
<td>MCA</td>
<td>Saccular</td>
</tr>
<tr>
<td>Our case (2016)</td>
<td>50F</td>
<td>MCA</td>
<td>Saccular</td>
</tr>
</tbody>
</table>

To the best of our knowledge, IA in patients with OI has been reported in only seven cases, and there are no such case reports from India (Table 1).

Conclusion

There may be some causative relationship between OI and IA because there are several reported cases of cerebral aneurysm in patients with OA. We propose that it may be worthwhile to screen patients with OI for asymptomatic aneurysm in order to prevent complications of ruptured IA.

References