



Review Article

Rectus gyrus hematoma: An overview

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ABSTRACT

Background: Rectus gyrus hematoma (RGH) is a localized intracerebral hemorrhage involving the most medial part of the orbital surface of the frontal lobe. It can be an imaging finding in the setting of a ruptured anterior communicating artery aneurysm; however, other differentials are rarely reported in the literature. In this paper, we opt to present for the 1st time an overview of RGH regarding its history, anatomical correlation, and related neuroimaging with particular emphasis on the potential differential diagnosis for underlying pathologies.

Methods: A literature review was conducted in PubMed, Medline, and Google scholar databases to review the existing literature highlighting the history, pertinent anatomy, and clinical characteristics of RGH.

Results: The literature review yielded papers targeting the RGH neither as a radiological sign nor as a surgical correlate to the cerebrovascular lesion. We used the available indirectly related articles to formulate an overview to serve the aim of this paper and to highlight the potential value of studying the RGH.

Conclusion: The RGH may represent an overlooked radiological finding that has potential significance through its relation to a set of vascular lesions affecting the brain. Further studies into the topic are needed to expand the utility of this sign.

Keywords: Aneurysm, Brain anatomy, Gyrus rectus, Intracranial hemorrhage, Rectus gyrus

BACKGROUND

Rectus gyrus hematoma (RGH) is a localized intracerebral hemorrhage in the medial aspect of the sub-frontal area. The term jet hematoma or flame hemorrhage also can be used to describe such intracerebral hematoma. RGH may occur due to a ruptured intracranial aneurysm adjacent to the frontal lobe. A ruptured anterior communication artery (Acom) aneurysm is a common encountered etiology of RGH as it is closely related to the sub-frontal area. However, other associated conditions may be considered in the differential diagnosis, such as arteriovenous malformation (AVM) and cavernous malformation. For these multiple pathologies associated with RGH, one of the underlying mechanisms for developing hematoma within the rectus gyrus (RG) is the pressure difference between the area in and outside the brain parenchyma.^[5] On the other hand, RGH is rarely discussed in the literature in various aspects, and there is no case series in the literature highlighting

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this radiological sign. Therefore, in this paper, we opt to present for the 1st time an overview of RGH regarding its history, anatomical correlation, and associated differential diagnosis.

HISTORY

The history of precisely identifying intracerebral hematomas begins with computed tomography (CT) scans in the 1970 s. Pasqualin *et al.* 1986 argued that before the clinical use of CT scan in 1976, angiography was not accurate enough to detect such lesion. Moreover, even the cases that underwent autopsy before 1976 could not recognize the hemorrhage intracranially as it is small and may fade post-mortem quickly.^[11] With the continued use of the CT scan in practice, identifying such pathologies becomes easier to assist in diagnosing and planning for further management. Consequently, the radiological sign of RGH become easier to identify with the advancement of diagnostics tools. This sign can be analyzed and highlighted more and it can be included in the radiological criteria for some ruptured aneurysms. Obviously, it is not yet incorporated in imaging-based gradings or scales while dealing with hemorrhagic cerebral vascular lesions such as aneurysmal subarachnoid hemorrhage (SAH).

PERTINENT ANATOMY AND FUNCTION OF RG

The RG, also called the straight gyrus, occupies the inferior aspect of the frontal lobe in the medial margin. Boundaries of the RG, medially the interhemispheric fissure, and wrap around the inferomedial surface of the frontal lobe. The rostral gyrus is located superiorly, separated by the inferior rostral sulcus — the olfactory sulcus significant landmark separating RG laterally from the medial orbital gyrus.^[13] In the anterior aspect, it continues to the inferior frontopolar gyrus to form the frontal pole. The RG is anterior-inferiorly related to the anterior cranial fossa. Further, multiple structures are situated posterior to RG, which include anterior perforated substance, septal area, and optic chiasm.

The function of the gyrus rectus remains unclear; consequently, many authors call it non-functional gyrus because there are no specific functions related to it.^[7] Furthermore, for the same arguments, parts of the RG can be resected safely during the clipping of the Acom aneurysm. On the other arm, several studies proposed that disinhibition as a behavioral abnormality has been linked with bilateral gyrus rectus lesions.^[3,6,10] However, extensive studies are demanded to reach a more precise identification of the RG function.

DIFFERENTIAL DIAGNOSIS

Ruptured intracranial aneurysms

Multiple pathologies may be associated with RGH; however, based on our experience, a ruptured Acom aneurysm is

located at the top of the differential diagnosis, primarily when directed superiorly or anteriorly or combined superior-anterior projection. Moreover, RGH due to rupture Acom aneurysm is usually associated with intraventricular hemorrhage in the lateral ventricle frontal horn [Figure 1].^[1,9] The usual CT scan findings include hyperdense lesions in the affected frontal lobe. Moreover, the laterality of the RGH indicates the projection of the Acom aneurysm, and it may be associated with local or diffuse SAH.

Based on the literature, other rupture aneurysms near RG have been reported to be associated with RGH, including a left distal internal carotid aneurysm in which imaging showed restricted left RG hematoma with SAH.^[14] Furthermore, other ruptured aneurysms linked to RGH include a left paraclinoid internal carotid artery aneurysm leading to the left GR hematoma without SAH, and anterior ethmoidal artery aneurysm rupture has been described to be in association with RGH.^[4,12]

Non-aneurysmal pathologies

The literature did not name the RGH as a finding of any non-aneurysmal lesions. However, one can argue that hemorrhage in the inferomedial aspect of the frontal lobe from any cause can be included in the spectrum of RGH. Based on our experience, non-aneurysmal associations with RGH can include frontal AVM and cavernomas [Figure 2]. Hemorrhagic tumors within the frontal lobe can have a related radiological finding. It is of paramount importance to include those in the differential of RGH in addition to the classic etiology represented by ruptured Acom aneurysm.^[2,8]

SYMPTOMS AND SIGNS

RGH can have variable presentations, mainly dependent on the underlying associated pathology. The recognition of direct and precise symptoms from the RG lesion is feasible



Figure 1: (a) Case 1: A 43-year-old female presented with a sudden onset headache. Computed tomography scan of the head (Axial view) showing intracerebral hemorrhage in the left the frontobasal area (Rectus gyrus). (b) 3D constructed angiography demonstrating a superior-anteriorly directed AcoA aneurysm (white arrow).

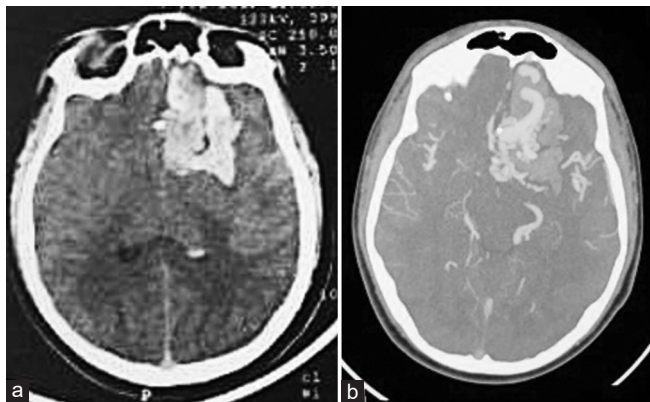


Figure 2: (a) Case 2: A 14-year-old male presented with loss of consciousness. Computed tomography (CT) scan of the head (Axial view) shows the left intracerebral haemorrhage in the frontal lobe within the rectus gyrus and there are no signs of subarachnoid hemorrhage. (b) CT angiography scan of the head (Axial view) illustrates a tuft of vessels (Arteriovenous malformation) in the left rectus gyrus.

only after the functional significance of this anatomical structure is well addressed, a topic that can be addressed in the future with more dedicated studies tackling this issue.

In general, the RGH can have a presentation related to the underlying pathology. In patients with ruptured Acom aneurysms, the symptoms are usually related to SAH, such as headache, vomiting, and other symptoms of SAH.^[4,8,12] Disinhibition as one of the possible presentations has been reported. Winckler *et al.* reported a case of a patient who had an athymhormic syndrome where there is a loss of interest for anterior preoccupations, loss of subjective feeling, mainly when dealing with a pleasant or unpleasant situation (anhedonia), and loss of spontaneity.^[14] The right lower limb weakness was documented when Patankar and Vaja reported an unusual presentation of RGH.^[12] In addition, recurrent headaches with seizure episodes were reported as a potential presentation by Kareem *et al.*^[8]

PROGNOSIS

The isolated clinical prognosis of RGH cannot be specified based on the current available evidence. However, the general overview based the available reports, there is a noticeable good prognosis trend from all the described etiologies underlying RGH.

Limitations and future direction

The available literature did not study the GRH sign as an independent factor to assess its significance and its potential impact on the outcome. A large and multicenter study is required to evaluate this sign and its clinical and surgical potential correlation.

In summary, this article highlights an overview of RGH, beginning with its first recognition after CT scans became widely available. Further, the relevant anatomy and function of the RG were discussed. A differential diagnosis of this sign is provided based on whether it is an aneurysmal cause or others. In this study, we are the first to pinpoint the potential value of this sign and list the available possible differential diagnoses in addition to the already known that the RGH is a valuable radiological clue in the setting of a ruptured Acom aneurysm.

CONCLUSION

The RGH may represent an overlooked radiological finding that has potential significance through its relation to a set of vascular lesions affecting the brain. Further studies into the topic are needed to expand the utility of this sign.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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