

# Over-the-counter analgesic powder use in patients presenting with intracerebral hemorrhage

## A case series

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### Abstract

**Introduction:** Over-the-counter (OTC) analgesics including aspirin-containing powder formulations (BC Powder, Goody's Powder) (ACPFs) are commonly utilized in the United States. While the ACPFs have been associated with upper gastrointestinal bleeding, we describe a case series of patients presenting with intracerebral hemorrhage (ICH) within 24 hours of ingestion.

**Methods:** We reviewed all ICH patients presenting to a comprehensive stroke center from September 1, 2014 through June 30, 2016 to identify patients who reported taking BC Powder or Goody's Powder within 7 days of their stroke. Baseline characteristics, medication use, stroke risk factors, clinical imaging, and laboratory testing were reviewed retrospectively.

**Results:** Of 334 patients admitted with ICH during the study period, 6 (2%) reported use of OTC analgesic powders within 1 week of their index stroke. All had consumed at least 1 packet within 24 hours of their ICH. All patients were African American and all except 1 patient were females. Three patients had no identified traditional stroke risk factors and 3 other patients had evidence of mild hypertension history.

**Conclusions:** Over-the-counter analgesic powders containing high doses of aspirin including BC Powder and Goody's Powder may contribute to ICH in patients with no or minimal risk factors. Providers should inquire about the use of these powders in ICH patients particularly among African Americans.

**Abbreviations:** ACPF = aspirin-containing powder formulation, AVF = arteriovenous fistula, AVM = arteriovenous malformation, COX1 = cyclooxygenase-1, CTA = computed tomography angiography, ICH = intracerebral hemorrhage, MRA = magnetic resonance angiography, NSAIDs = nonaspirin nonsteroidal antiinflammatory drugs, NSAIDs = nonsteroidal antiinflammatory drugs, OTC = over-the-counter, PG = prostaglandin.

**Keywords:** intracerebral hemorrhage (ICH), nonsteroidal antiinflammatory drugs (NSAIDs), over-the-counter (OTC)

## 1. Introduction

Over-the-counter (OTC) drugs are widely used in the United States. A prior study of medication use patterns in the United States found that more than 80% of American adults used at least 1 OTC or prescription drug each week.<sup>[1]</sup> The most frequently utilized medications include OTC analgesics with 17% to 23% of the population using these in the preceding week.<sup>[1]</sup> Chronic OTC analgesic use is also frequently used in the elderly population for pain relief.<sup>[2,3]</sup>

Editor: N/A.

The authors have no conflicts of interest to disclose.

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Medicine (2018) 97:15(e0334)

Received: 13 January 2018 / Received in final form: 22 February 2018 /

Accepted: 14 March 2018

<http://dx.doi.org/10.1097/MD.0000000000010334>

OTC analgesics commonly include acetaminophen, nonsteroidal antiinflammatory drugs (NSAIDs) including aspirin, ibuprofen, and naproxen- and powder formulations (BC Powder, Goody's Powder). Adverse effects including increased upper gastrointestinal (GI) bleeding tendency is a commonly reported side effect of the use of NSAIDs.<sup>[2]</sup> Cyclooxygenase (COX) inhibition by NSAIDs leading to interference with protective prostaglandins (PGs) contributes to upper GI bleeding.<sup>[2]</sup> Aspirin and nonaspirin nonsteroidal antiinflammatory drugs (NSAIDs) also affect systemic hemostasis by inhibiting platelet COX.<sup>[4]</sup> Platelet COX-1 enables conversion of arachidonic acid into thromboxane A<sub>2</sub> which mediates platelet aggregation; inhibition of COX-1 thereby leads to increased bleeding time.<sup>[2,4]</sup> Aspirin is an irreversible inhibitor while NSAIDs reversibly inhibit COX-1 which lead to differential pharmacodynamics relevant to COX-1 blockade. Risks of bleeding with aspirin or NSAIDs are enhanced with use of large doses, concomitant use of alcohol, anticoagulants or by presence of comorbidities like liver disease, renal failure, and coagulopathies.<sup>[4]</sup> Hemorrhagic stroke has been associated with use of aspirin previously.<sup>[4-7]</sup> This may be attributed to impaired primary hemostasis as a result of platelet inhibition when an imbalance between thromboxane and prostacyclin occurs.<sup>[4,8]</sup>

In this study, we evaluated the frequency of recent OTC analgesic powder use with BC Powder (Aspirin 845 mg, Caffeine 65 mg) and Goody's Powder (Aspirin 520 mg, Acetaminophen

260 mg, Caffeine 32.5 mg, Potassium 60 mg) use in patients presenting with ICH.

**2. Methods**

In this case series, we retrospectively reviewed all ICH patients presenting to Emory University Hospital from September 1, 2014 through June 30, 2016 with documentation of BC Powder and Goody’s Powder use within 7 days of their index stroke. Hemorrhagic stroke was confirmed with noncontrast CT and patients underwent cardiac telemetric monitoring, serial neurological examinations, and brain imaging to evaluate for secondary causes of ICH including MRI brain with and without contrast, head magnetic resonance angiography (MRA) and/or computed tomography angiography (CTA); all brain imaging was interpreted by board certified neuroradiologists. Patients were excluded from the study if ICH was secondary to any or a combination of following causes: head trauma, excessive anticoagulation, aneurysms, arteriovenous malformation (AVM) or arteriovenous fistula (AVF), or recent illicit drug use. A nonsurgical strategy of acute blood pressure control in combination with avoidance of antithrombotic use was used to treat ICH patients.

Data were collected from patients’ electronic medical records including demographics, past medical history, secondary causes of bleeding if any, medication history, clinical evaluation, diagnostic testing including laboratory results, brain imaging, and cerebral vascular imaging. The study was approved by the Emory institutional review board.

**3. Results**

During the 22-month study period, 334 patients were admitted with ICH including 6 patients (2%) with documented use of OTC analgesic powders (BC Powder, Goody’s Powder) within 1 week of their index stroke. All patients had utilized at least 1 packet of the OTC analgesic powder within 24 hours of their stroke, all were African American, and 5 (83%) patients were female. Three patients had no identified traditional stroke risk factors and 3 other patients had mild hypertension with mild left ventricular hypertrophy identified on echocardiography (Table 1). ICH location was primarily in basal ganglia (67%) with one patient having hemorrhage in the cerebellum and one patient with hemorrhage in the occipital lobe. The most common indication for analgesic powder use were headaches and were being used for at least 7 days and up to 6 months before ICH presentation though brain imaging showed evidence of an acute ICH in all patients, suggesting that the use of analgesic powders had preceded the onset of ICH.

**4. Discussion**

We identified patients with ICH who had consumed OTC analgesic powders within 1 week of their index stroke and were found to have no secondary causes of bleeding, no prior history of illicit drug abuse and minimal or no stroke risk factors. Given that all patients had taken at least 1 powder packet daily for at least 1 week before presentation and that brain imaging showed evidence of an acute (rather than subacute) ICH further supports that analgesic powder was being used before the onset of the ICH and not after the ICH had already occurred. Our findings support 1 previous case report which associated BC Powder overdosing in a patient with ICH.<sup>[9]</sup>

**Table 1**  
**Patient baseline characteristics, risk factors, and analgesic powder use.**

Patient no.	Stroke type	Stroke location	Age	Sex	Race	Stroke risk factors	Powder type used	Reason for powder use	Powder amount	Last use of powder before stroke
1 (YW)	ICH	Basal ganglia	56	Female	African American	None	BC Powder	Joint pains	50 packets in 30 d before stroke	Within 24 h of the stroke
2 (NS)	ICH	Cerebellum	70	Female	African American	Diabetes (A1c 9.4), HTN, OSA	Goody Powder	Headache	Daily packet use for 14 d	Within 24 h of the stroke
3 (IB)	ICH	Basal ganglia	39	Female	African American	None	Goody Powder	Chronic headaches since childhood	Daily packet use for 15 d	Within 24 h of the stroke
4 (SA)	ICH	Basal ganglia	63	Male	African American	HTN (mild concentric LVH)	Goody Powder, BC Powder	Intermittent headaches	Daily packet use of both powders for 6 mo	Within 24 h of the stroke
5 (JR)	ICH	Occipital lobe	45	Female	African American	None	Goody Powder	Intermittent headache	Daily packet use for 1 wk	Within 24 h of the stroke
6 (MB)	ICH	Basal ganglia	55	Female	African American	HTN (mild LVH)	BC Powder	Intermittent headache	Daily packet use for 1 wk	Within 24 h of the stroke

HTN = hypertension, ICH = intracerebral hemorrhage, LVH = left ventricular hypertrophy, OSA = obstructive sleep apnea.

The principal components of one BC Powder packet are aspirin (845 mg) and caffeine (65 mg) while one Goody's Powder packet consists of aspirin (520 mg), acetaminophen (260 mg), caffeine (32.5 mg), and potassium (60 mg). Previously, results from a randomized clinical trial for primary prevention of cardiovascular disease with 325 mg of daily aspirin among healthy male physicians demonstrated increased risk of hemorrhagic stroke (relative risk 2.14, 95% CI, 0.61–4.57;  $P = .06$ ).<sup>[15]</sup> A meta-analysis incorporating 16 trials involving aspirin treatment for myocardial infarction and ischemic stroke prevention involving 108 hemorrhagic stroke cases demonstrated a significant absolute risk increase in hemorrhagic stroke of 12 events per 10,000 persons (95% CI, 5–20;  $P < .001$ ).<sup>[16]</sup> A meta-analysis involving nine trials of aspirin with different doses (50–500 mg daily or every other day) used for 3.6 to 10.1 years showed an increased risk for hemorrhagic stroke by about 30% regardless of dose.<sup>[10]</sup>

Both these OTC analgesic powder formulations contain caffeine. Previous studies have suggested that caffeine-containing medications may also be associated with an increased risk of both subarachnoid and intracerebral hemorrhage (ICH).<sup>[11,12]</sup> The proposed mechanism involves caffeine's effect of elevating systemic arterial blood pressure.<sup>[13,14]</sup> An acute increase in blood pressure may lead to loss of cerebral blood flow autoregulation<sup>[15]</sup> and disruption of the blood brain barrier<sup>[16]</sup> resulting in a possible subarachnoid or ICH.<sup>[17]</sup> While there is stronger evidence for high doses of aspirin and their association with ICH, the presence of caffeine in these OTC analgesic powder formulations increasing the propensity of an ICH warrants further investigation.

In our case series, all ICH patients using these analgesic powders were African American. In comparison to Caucasians, African Americans have twice the incidence of ICH due to higher risk of hypertension and drug abuse.<sup>[18,19]</sup> In our analysis however we excluded all patients who had evidence of moderate or severe HTN and also patients who had positive urine drug screen. Whether the use of these OTC analgesic powders (BC Powder and Goody's Powder) by African Americans is more common due to directed marketing efforts or due to other factors is less clear. A previous study did demonstrate the use of certain NSAID products, including BC Powder and Goody's Powder, to be twice as common in African Americans as compared to Caucasians.<sup>[20]</sup>

## 5. Conclusion

OTC analgesic powders such as BC Powder and Goody's Powder may be associated with increased risk of hemorrhagic stroke in African Americans who have minimal to no stroke risk factors, likely due to their formulations containing high amounts of aspirin. Providers should inquire about the use of these powders in ICH patients particularly among African Americans.

## Author contributions

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