The routine use of LDA carries a theoretical risk of complicating the sequelae of traumatic brain injury, especially in patients older than 60 years of age.

There is no doubt that the abundant use of full anticoagulation in patients with cardiac valve diseases is a significant risk factor for spontaneous and traumatic intracranial hemorrhage; however, there are no data regarding the risk of using antiplatelet agents such as LDA in patients with head injury.

The purpose of this study was to investigate the relationship between the use of LDA and intracranial hemorrhage in patients older than 60 years of age.

**Clinical Material and Methods**

Data for this study were collected at two locations: Hadassah University Hospital, Jerusalem, and Soroka Hospital, Beer Sheva, during a period of 2 years.

Between 1995 and 1997, 231 patients matching our inclusion criteria were culled from among all patients admitted to the emergency departments at these two institutions. One hundred seventy-two patients were from Hadassah Hospital and 59 were from Soroka Hospital. Patients were included in the study if they fulfilled the following criteria: 1) sustained a mild (GCS score between 13 and 15) or moderate (GCS score between 9 and 12) head injury not more than 1 week before arrival at the emergency department; 2) were 60 years of age or older; and 3) were taking no anticoagulant medication or were taking aspirin (typical dosage 100 mg/day). Patients who received any medication other than LDA, which could affect their coagulation mechanism, and patients with hematological and oncological diseases were not included in the study.

Patients were sorted into an aspirin-treated group or a control group, depending on whether they were receiving aspirin.
On admission to the emergency department, all patients received the following treatment: 1) routine general physical and neurological examinations; 2) routine laboratory tests; 3) CT scanning; and 4) if the CT examination revealed an intracranial hematoma requiring surgical treatment, emergency surgery. If the hemorrhage was insignificant or considered borderline as an indication for surgical treatment, the patient was placed under observation and a second, and if necessary a third, CT scan was obtained.

Statistical Analysis

The frequencies and types of hemorrhagic intracranial findings were compared for the two groups. Statistical analysis was performed using a commercially available statistical software program (SPSS/PC version 10; SPSS, Inc., Chicago, IL).

Results

Demographic Data

The differences between the aspirin-treated group (110 patients) and the control group (121 patients) are itemized in Table 1. The following parameters were statistically insignificant: patient age, sex, cause of trauma, time from injury to arrival at the emergency department, external signs of injury, loss of consciousness, initial neurological condition, and blood pressure.

A few statistically insignificant yet interesting points are noteworthy when analyzing the study demographics. There were slightly more women than men in each group, probably because of the prevalence of women in the general population of this age range. There were more men in the aspirin-treated group than in the control group, probably because ischemic heart disease, which is the most common indication for aspirin prophylaxis, is more prevalent among men. There was a higher proportion of background vascular diseases in the aspirin-treated group, probably because aspirin is routinely prescribed as a prophylactic treatment in patients with a history of vascular diseases.

Traumatic Intracranial Hemorrhages Identified on CT Scans

General Incidence of Traumatic Intracranial Hemorrhage. In 173 patients there was no evidence of traumatic intracranial hemorrhage on the CT scan (83 patients [75.5%] in the aspirin-treated group and 90 patients [74.4%] in the control group). The distribution of types of traumatic intracranial hemorrhage in the remaining 58 patients is illustrated in Fig. 1. There was no statistically significant difference in the frequencies or types of this hemorrhage between the two groups.

Traumatic Intracranial Hemorrhage Requiring Surgical Intervention. Of the 27 patients (24.5%) with traumatic intracranial hemorrhage in the aspirin-treated group, five (4.5%) required surgical evacuation of the hematoma. One patient (0.9%) died as a result of the hemorrhage despite having undergone surgery. Of the 31 patients (25.6%) with traumatic intracranial hemorrhage in the control group, five (4.1%) required surgical evacuation of the hematoma. Two patients (1.6%) died of the hemorrhage despite having undergone surgery.

The rates of surgery for the hemorrhage are illustrated in Fig. 2. There was no statistically significant difference in the rates of surgery between the two groups. As for the op-
Aspirin and head injury

eration themselves, there was no difference in blood loss during surgery, no patient required an intraoperative blood transfusion, and there was no incidence of rebleeding requiring a second surgery for a postoperative hematoma.

**Statistical Significance of Other Parameters**

The parameters that were analyzed for the entire study group (see Demographic Data) were also analyzed for the subset of patients who suffered a traumatic intracranial hemorrhage (27 patients in the aspirin-treated group and 31 patients in the control group). The following results were obtained.

**Age of the Patient.** There was a statistically insignificant tendency in both groups toward a higher rate of traumatic intracranial hemorrhage as the patient's age increased. In the aspirin-treated group, the mean age (± SD) of patients with this traumatic injury was 80.3 ± 8.6 years compared with 77.8 ± 7.6 years in patients without hemorrhage. In the control group, the mean age of patients with this hemorrhage was 80.3 ± 7.9 years compared with 78.2 ± 9 years in patients without hemorrhage.

**Sex of the Patient.** There was a statistically insignificant tendency in both groups toward a higher rate of traumatic intracranial hemorrhage among men. In the aspirin-treated group, 28.6% of men had sustained this injury compared with only 21.3% of women. In the control group, 34.9% of men had sustained this injury compared with only 20.5% of women.

**Cause of the Trauma.** There was no difference in the incidence of traumatic intracranial hemorrhage related to the cause of trauma in either group.

**External Signs of Head Injuries.** There was no correlation between the presence or type of external injury and the rate of traumatic intracranial hemorrhage.

**Timing From Injury to Arrival at the Emergency Department.** There was a significant (p = 0.014) tendency in both groups for patients who suffered a traumatic hemorrhage to arrive at the hospital more quickly, the majority within the first 3 hours. Nevertheless, the time from injury to arrival at the emergency department was confirmed by a Student t-test to be of no statistical significance for the patient's ultimate status.

**Loss of Consciousness due to the Head Trauma.** A significant (p = 0.002) tendency was observed in both groups toward a higher rate of traumatic intracranial hemorrhage in patients with a recorded loss of consciousness due to the trauma. In the aspirin-treated group, 35.5% of patients who had lost consciousness had suffered a traumatic intracranial hemorrhage, compared with only 18.6% of patients who had remained conscious at all times. In the control group, 45.4% of patients who had lost consciousness had suffered this injury, compared with only 15.7% of patients who had remained conscious at all times.

**Initial Neurological Condition.** In both the aspirin-treated and control groups a strong correlation was demonstrated between a lower GCS score on admission to the emergency department and a higher rate of traumatic intracranial hemorrhage. In the aspirin-treated group, patients in whom there was evidence of traumatic hemorrhage on the CT scan had a mean (± SD) GCS Score 13.8 ± 1.2, compared with a mean GCS Score 14.8 ± 0.67 in patients in whom the CT scan findings were normal (p = 0.0001). In the control group, patients with evidence of a traumatic intracranial hemorrhage on the CT scan had a mean GCS Score 13.7 ± 1.8, compared with a mean GCS Score 14.8 ± 0.44 in patients in whom the CT scan findings were normal (p = 0.002).

Note that the GCS score was the best predictor of the incidence of traumatic intracranial hemorrhage in both groups. The exact distribution of hemorrhage rates by GCS scores in both groups is illustrated in Fig. 3. Note that within both groups, even though some patients with GCS Score 15 on admission to the emergency department had traumatic intracranial hemorrhage, none of them required surgical intervention.

**Blood Pressure.** There was a strong correlation in both groups between an elevated systolic blood pressure on admission to the emergency department and a higher rate of traumatic intracranial hemorrhage (Table 2). There was no statistically significant correlation between an elevated diastolic blood pressure and a higher rate of this hemorrhage in either group.

**Discussion**

The results of this study demonstrate that the consumption of LDA does not affect the sequelae of mild-to-moderate head injury in patients older than 60 years of age. At low doses aspirin is known to diminish platelet aggregation by reducing the amount of thromboxane A2 produced,1 thus prolonging both bleeding and thrombin time and reducing platelet aggregation.14 Low-dose aspirin is used prophylactically for patients suffering from vascular disorders, such as ischemic heart disease and cerebrovascular disease, as well as for any man older than 45 years of age who has at least two cardiac risk factors.7 The typical aspirin dose among study participants was 100 mg/day, the strength of the most popular LDA product on the market in Israel and Europe today.
It has been demonstrated that aspirin ingestion increases the risk of hemorrhagic complications during cardiac surgery and prostate surgery. Maternal ingestion of aspirin is associated with a higher incidence of neonatal intracranial hemorrhage. Anticoagulation with coumarone derivatives is a known risk factor for higher incidences of mortality and morbidity among patients with head injuries. In neurosurgery, however, evidence-based data on the effect of aspirin on the risk of bleeding during elective and emergency surgery is sparse. Reymond, et al. demonstrated a correlation between aspirin ingestion and the hemorrhagic complications of serious head injuries. Aspirin has been associated with several occurrences of nontraumatic spinal epidural hematoma and spontaneous bleeding from an intracranial tumor. Aspirin is also associated with an increased risk for the development of a chronic subdural hematoma and postoperative intracranial hemorrhage.

It is well known that the older population is at greater risk for head injury. This same older population is also the group that most often uses aspirin on a regular basis. The focus of this study therefore was to examine whether regular LDA use increases the risk of traumatic intracranial hemorrhage for patients older than 60 years of age following mild-to-moderate head injury. If regular LDA use does in fact increase the danger of traumatic intracranial hemorrhage in this population, this may have a significant medical and economic impact. First, the added vascular and cardiac risks must be balanced against the potential risks in cases of head injury. Second, patients receiving LDA may require a different routine treatment when they are admitted to the emergency department after sustaining a head injury.

The following important points were noted in this study. 1) There was no difference in either the type or frequency of intracranial hemorrhages between the aspirin-treated group and the control group. Special attention paid in the emergency department to regular LDA users with mild-to-moderate head injuries does not seem to be warranted; that is, a history of LDA consumption noted in the patient’s initial workup is not a factor to consider when deciding whether a CT scan is required. 2) There was a relatively high rate of hemorrhagic findings on CT scans in patients who otherwise appeared to be in an excellent or good neurological condition. Of the patients with GCS Score 15, a sizeable percentage harbored some form of traumatic intracranial hemorrhage (13.8% of patients in the aspirin-treated group and 16.3% of patients in the control group). All in all, of patients admitted after they had sustained mild head injuries (GCS score between 13 and 15), almost one quarter (22.1%) had intracranial hemorrhages that were revealed on CT scans. Similar findings have been published elsewhere. 3) The most important predictor of traumatic intracranial hemorrhage and the possible need for surgery was found to be the clinical condition of the patient on presentation at the emergency department, with no correlation to aspirin consumption. None of the patients in both groups admitted to the emergency room with a GCS Score 15 required surgery, even if their CT scans revealed a hemorrhage. It could therefore be argued that patients with GCS Score 15 in this population do not require a routine CT scan, regardless of whether they had received aspirin. Others, however, may argue that the mere knowledge of the existence of a traumatic intracranial hemorrhage, even if it does not require surgery, is important for medical and medicolegal reasons.

<table>
<thead>
<tr>
<th>Systolic BP (mm Hg)</th>
<th>Total No. of Patients</th>
<th>No. W/ TICH (%)</th>
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<tbody>
<tr>
<td>aspirin-treated group (p = 0.008)</td>
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<td></td>
</tr>
<tr>
<td>≥180</td>
<td>14</td>
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<tr>
<td>150–179</td>
<td>41</td>
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<td>110–119</td>
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<tr>
<td>control group (p = 0.015)</td>
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<tr>
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<tr>
<td>110–119</td>
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<td>5 (50)</td>
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</table>

*BP = blood pressure.
Conclusions

There was no difference in the frequencies or types of traumatic intracranial hemorrhage between study participants who received LDA prophylaxis and those who did not. Regular LDA use does not increase the rate of surgically relevant parenchymal or meningeal bleeding in cases of minor or moderate head injuries in patients older than 60 years of age. Patients who receive regular LDA do not require special attention or treatment in the emergency department. Instead routine treatment should be determined by the clinical condition of the patient on arrival.

References


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