

## **Continuing Aspirin Therapy Does Not Increased Risk Of Bleeding For Patients Undergoing Minor Dental Procedures**

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**Abstract:** *Aspirin is a common, chronically administered preventive treatment for cardiovascular disease . It has been used traditionally as analgesic and anti- inflammatory for centuries and is one of the world's most widely used drug. Aspirin or acetyl salicylic acid is still the only non steroidal anti-inflammatory drug used in the treatment and prevention of thromboembolic diseases. However, the majority of recommendations to stop aspirin therapy were not from dental literature. The amount of blood loss depends on the invasiveness of the surgical procedure. No surgical interventions are alike and therefore strict guidelines to alter or stop these medications without considering the invasiveness of the surgical procedure is a gross mistake.The debate as to stop or not to stop aspirin before minor surgical procedures like a simple dental extraction is a serious concern for patients and the dental practitioner. The aim of this article is to present the review of literature regarding safety of dental extraction procedure in patients on aspirin therapy.*

**Keywords:** *Aspirin, Dental Extraction, Bleeding, Thromboembolism*

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### **I. Introduction**

Medical practitioners commonly advice their patients who are on antiplatelet therapy to either stop or alter their medications prior to surgical procedures due to fear of excessive and uncontrolled bleeding. It is a proven fact that aspirin causes increased risk of intraoperative as well as postoperative bleeding and also increased risk of thromboembolic events such as myocardial infraction and cerebrovascular accidents if the drug is continued. [1]Thrombotic and thromboembolic occlusion of blood vessels is the main cause of ischemic events in heart, lungs, and brain. [2]In case of blood vessel injury, hemostatic mechanism is responsible for stopping the extravasation. Mainly hemostatic mechanisms are characterized by two consecutive phases: Primary and secondary. Primary mechanism arrests early bleeding as a result of platelet plug formation. [3]The secondary hemostasis phase is mediated by a complex cascade of clotting factors which helps in the formation of fibrin clot. In recent years, lot of research has been done and progress has been made in the field of antiplatelet agents and anticoagulants. These drugs have been utilized for the management of arterial thrombosis also. [4] Even though a number of antiplatelet and anticoagulant agents have been developed, aspirin and warfarin remain the standard drugs of choice.[5]

Development of aspirin dates back to 1897 and is considered as one of the safest and cheapest drugs worldwide. A general practitioner Lawrence Craven prescribed low-dose aspirin (baby aspirin) to his 400 patients and none of them developed myocardial infraction. This was probably the first time in medical history where aspirin was used to prevent myocardial infarction. Since then, it has become the drug of choice for cardiologists.[6,7]

Aspirin is an approximately 150 to 200 fold more potent inhibitor of the constitutive enzyme COX-1 than the inducible isoform COX-2. Cyclo oxygenase-1 is highly sensitive to low doses of aspirin (40-80 mg daily)[9,10]. Complete inactivation of platelet COX-1 as well as maximum inhibition of collagen-induced platelet aggregation is achieved at 160 mg of aspirin taken daily [11]. The antithrombotic properties of aspirin are effective upto 320mg daily [12]. Aspirin is maximally effective as an antithrombotic agent at doses much lower than those required for anti-inflammatory and analgesic functions [13]. Aspirin affects clotting by inhibiting platelet aggregation but they do so by a variety of different mechanisms. Aspirin irreversibly acetylates cyclooxygenase, inhibiting the production of thromboxane A<sub>2</sub> [14]. This results in decreased platelet aggregation by adenosine diphosphate (ADP) and collagen. Patients on aspirin will have a prolonged bleeding postoperatively. Fearing this complication medical practitioners are prompted to stop aspirin intake for 7 to 10 days before any surgical procedure. The concept behind this is, platelets survive in vascular system for 7-10 days. Aspirin begins irreversibly inhibiting platelet aggregation within one hour of ingestion and this lasts for the life of the platelets (7-10 days) [14]. The effect is overcome by the manufacture of new platelets [15].

Physiologically, hemostasis is the body's mechanism designed to prevent blood loss by forming a clot within injured blood vessels. Hemostasis in the healthy individual involves interaction between 4 biologic systems: the blood vessel wall, the blood platelets, the blood coagulation system, and the fibrinolytic system.

Blood vessel constriction is an essential first stage (vascular phase); platelet adhesion (platelet phase) and aggregation (coagulation phase) follow. The haemostatic mechanism is initiated at the site of injury by local activation of surfaces and release of tissue thromboplastin, resulting ultimately in formation and deposition of fibrin. The coagulation process is regulated by physiologic anticoagulants. Activation of fibrinolysis is triggered by the presence of fibrin and tissue-type plasminogen activators at the site of fibrin formation, a process regulated by physiologic inhibitors such as antiplasmin, histidine-rich glycoprotein, and plasminogen activator inhibitor [16].

Tooth extraction is a common procedure in dentistry. Soon after extraction the body attempts to form a fibrin clot [17]. The fibrin clot becomes granulation tissue which contains blood vessels, fibroblasts and chronic inflammatory cells programmed to prevent infection [18]. Antiplatelet drugs are drugs that interfere with the platelet phase by decreasing the platelet aggregation and interfere with the clot formation.

The prophylactic role of aspirin and other nonaspirin antiplatelet drugs has been confirmed by Anti-Platelet Trialists Collaboration after previous thromboembolic events. Vascular events were reduced by 20–25% in the first few years. The overall mortality rate was reduced by 12%. These results were based on a meta-analysis of 287 studies which involve a total of 135,000 patients [7]. Other studies and publications reported that antiplatelet treatment has reduced the overall mortality of vascular disease by 15% and nonfatal vascular complications by 30% [8].

Aspirin is effective as antiplatelet drug at much lower doses than that required for analgesic and anti-inflammatory functions [9]. Antiplatelet activity of aspirin has been seen even at dose as low as 40mg/day [10]. The antiplatelet properties are effective up to 320 mg daily dose [9]. In fact, doses of aspirin >320mg/day may even decrease the effectiveness as antiplatelet agent due to inhibition of prostacyclin production [11].

Various evidence based studies recommended aspirin in the range of 75–100mg/day for the prophylaxis against serious vascular events in high risk patients [9, 11]. However, recent randomized clinical trial indicates that 160mg/day is the optimal dose of aspirin to prevent myocardial infarction and stroke [12]. In clinical situations where immediate antithrombotic effect is required (such as unstable angina, acute myocardial infarction, or stroke), a loading dose of 300mg is recommended [11].

Aspirin should not be taken by people who are allergic to ibuprofen or naproxen, or to have salicylate intolerance or to a more generalized drug intolerance to NSAIDs, and caution should be exercised in those with asthma or NSAID-precipitated bronchospasm. Due to its effect on the stomach lining, manufacturers recommend that people with peptic ulcers, mild diabetes, or gastritis seek medical advice before using aspirin. There is an increased risk of stomach bleeding, even in the absence of these conditions, when aspirin is taken with alcohol or warfarin. Patients with hemophilia or other bleeding tendencies should not take aspirin or other salicylates. Aspirin is known to cause hemolytic anemia in people who have the genetic disease glucose 6-phosphate dehydrogenase deficiency (G6PD), particularly in large doses and depending on the severity of the disease. People with kidney disease, hyperuricemia, or gout should not take aspirin because aspirin inhibits the kidneys ability to excrete uric acid and thus may exacerbate these conditions. Aspirin should not be given to children or adolescents to control cold or influenza symptoms as this has been linked with Reyes syndrome. [12,13,14,15]

The aim of this article is to present the review of literature regarding safety of dental extraction procedure in patients on aspirin therapy.

## **II. Review Of Literature**

Until the early 1980s, aspirin was used as an anti-inflammatory, analgesic and antipyretic drug for short periods only. The major side effects of aspirin—namely, gastrointestinal irritation and ulcers; tendency to develop gingival, nasal and intestinal hemorrhage; and asthma like attacks in asthmatic patients—limited administration of the drug to short periods (from two to five days) [5].

Studies conducted since the early 1980s have shown that the antiplatelet effect is elicited at low doses—of about 0.5 to 1.0 mg per kilogram per day—while the analgesic and antipyretic effects occur only at a daily dosage of 5 to 10 mg/kg, and the anti-inflammatory effect is achieved at a dosage of more than 30 mg/kg/day [9]. Thus, low doses of aspirin are sufficient for achieving anticoagulation with reduced side effects. Therefore, within the last decade there has been a rapid increase in the use of low-dose aspirin as a secondary preventive drug by patients who have cardio-vascular and peripheral vascular diseases [6]. The increasing popularity of aspirin, either alone or in combination with other drugs, has presented physicians and dentists with the dilemma of whether to advise patients to discontinue aspirin therapy before surgical procedures are performed.

Controversy exists in the literature regarding this issue. Many studies [7,8] have advocated stopping aspirin therapy seven to 10 days before elective surgery [9]. Conversely, other researchers have suggested that aspirin therapy should be continued regardless of the surgical procedure [10,11]

Valerin et al enrolled thirty-six patients (mean age 40.3 +/-10. 4:19 male) with 17 patients randomized to aspirin and 19 to placebo. No differences were noted between groups in baseline information, extraction time, difficulty of extraction, location of extraction sites, and compliance between the groups. They found no differences in bleeding outcomes for patients on aspirin versus placebo. Their findings suggest that there is no indication to discontinue the use of aspirin in patients requiring single tooth extraction.[16]

Lawrence and colleagues<sup>11</sup> recommended the continuation of aspirin therapy before elective dermatologic surgery if the patient's bleeding time was within normal limits. They found that bleeding time was prolonged in six (37.5 percent) of 16 patients receiving aspirin therapy; however, all of these patients had been receiving high doses of aspirin. The results of our study showed that when patients received a low dose of aspirin (100 mg), their bleeding time remained, without exception, within normal limits[17]. On the other hand, Scher<sup>12</sup> advocated stopping aspirin therapy before any surgical procedure performed on a non-emergency basis. He found that diffuse postoperative bleeding was associated with preoperative use of aspirin[18]. However, the patients in his study were also receiving a high dose of aspirin. Thomason and colleagues<sup>13</sup> described a patient receiving low-dose aspirin therapy whose platelet function was completely impaired and required infusion of platelets to control hemorrhage after gingivectomy. These authors suggested that the rarity of such cases points to a considerable variability in the individual platelet response to the drug.[19]

Canigral et al. conducted a research involving surgical extraction in patients on antithrombotic therapy. In 92% cases, the bleeding stopped within 10 min with pressure alone. This result was in accordance with the present study. [4]Gaspar et al. advocated that ambulatory oral surgical procedures can be performed in patients without discontinuing the use of aspirin. A recent recommendation from the American Heart Association and American College of Cardiology is either continuing aspirin or clopidogrel therapy for minor oral surgical procedures in patients with coronary artery stents or delay the treatment until prescribed regimen is complicated[20]. Two studies have evaluated bleeding on probing (BOP) for people taking aspirin. The first study randomized 46 persons to placebo, 81 mg aspirin, or 325 mg aspirin[21]. The people with baseline gingivitis (> 20% BOP sites) randomized to 325 mg aspirin had an increase in BOP compared with the placebo group. In a similar study, significant differences in BOP between placebo and both 81 mg aspirin and 325 mg aspirin were identified .[22]

Lemkin et al [23] and Mc Gaul et al [24] about postoperative bleeding after dental extraction due to aspirin have documented that there is increased postoperative bleeding after dental extraction and recommended to discontinue aspirin. According to Nach G.Daniel et al aspirin has been associated with increase in bleeding time and post operative heamorrhagic risk. For most surgical procedures it has been recommended that patient should stop taking aspirin before 7 – 10 days of the surgical procedure [25]. This was recommended on the basis of surgical studies which showed rise in both intraoperative and postoperative bleeding . Thomson et al in his study have found that there is a risk of bleeding after gingival surgery due to continuation of aspirin use and advised to stop aspirin before the procedure.[26]

Crispian Scully et al for uncomplicated forceps extraction of 1 to 3 teeth there is no need to interfere the aspirin dose. In patients taking 100 mg of aspirin daily bleeding can be controlled by suturing and local hemostatic measures. In patients taking higher dose of aspirin if the current value of bleeding is more than 20 minutes then surgical treatment should be postponed [27].

Many studies have proved that patients on low dose aspirin can undergo dental extraction without discontinuing the drug [5,13 ]. Studies related to general and cardiovascular surgery did not show any significance increase in bleeding. Sonksen et al showed that increase in bleeding time caused by daily aspirin dose of 300 mg did not exceed the normal limits in patients. Thus the patients need not stop taking Aspirin before dental surgery. Provided the heamorrhagic risk is not greater than thromboembolic risk associated by interrupting the dose of the drug.[28]

Napenas et al conducted a retrospective study to assess the bleeding complications in patients on single or dual anti-platelet therapy. Forty three patients on single or dual anti-platelet therapy underwent invasive surgical procedures consisting of dental extractions, periodontal surgery, sub-gingival scaling and root planning. They concluded that there is negligible risk of bleeding complications after invasive dental surgical procedures in patients taking single or dual anti-platelet therapy.[29]

Hemelik M et al performed 151 tooth extractions in 65 patients on 100 mg/day aspirin therapy. The frequency of postoperative bleeding was 1.54% in patients on aspirin therapy. All bleeding episodes were handled easily. They concluded that there is no need to stop 100 mg/day aspirin prior to dental extractions.[30]

Bajkin BV et al conducted a prospective study to evaluate the postoperative bleeding in patients on combined oral anticoagulant and aspirin therapy. A total of 213 patients were divided into three groups with 71 participants in each group. Group-A patients received combined oral anticoagulant + aspirin therapy. Patients in group-B received oral anticoagulant therapy. Patients in group-C received aspirin only. Three (4.2%) patients in group A, two (2.8%) in group B and none (0.0%) in group C presented with postoperative bleeding. The

difference was not statistically significant. All the cases of postoperative bleeding were easily controlled by local hemostatic measures. [31]

Shah A et al performed a prospective study to compare the incidence of bleeding complications among patients taking aspirin and those not taking aspirin at all. A total of 254 patients were enrolled in the study. Group-I patients (n=127) were taking 75-150 mg/day aspirin and continued it prior to extraction. Group-II (n=127) patients constitute the control group who were not taking any aspirin dose prior to extraction. One tooth was extracted by simple method in each patient of both groups. The results showed that 5 patients (3.93%) in aspirin group and 3 patients (2.36%) in control group presented with prolonged immediate bleeding which was managed by additional hemostatic measures. The difference was not statistically significant. Also 2 patients (1.57%) in aspirin group and 1 patient (0.78%) in control group presented with late bleeding at 12 hour postoperatively. This difference was again not statistically significant. Hemostasis was achieved easily by patient themselves with the help of pressure pack at home. None of the patient exhibited very late bleeding. They concluded that it is a safe practice to perform simple extraction of 1 tooth in patients taking 75-150 mg aspirin daily.[3]

Madan GA et al performed minor oral surgical procedures in patients on low-dose aspirin therapy (75-100 mg/day). The surgical procedures performed were simple & surgical extractions and implant placement. Suturing and pressure pack for 30 minute was used as hemostatic measure in all the cases. The results showed that only 1 patient after 3rd molar extraction show excessive bleeding intra-operatively which was easily managed by pressure pack soaked in 1% ferracrylum solution. There was no postoperative bleeding in any case. These authors concluded that most minor oral surgical procedures can be carried out safely without interrupting long term low-dose aspirin therapy.[32]

Ardekian et al conducted a prospective study to evaluate the risk of bleeding after tooth extraction with the use of aspirin 100 mg/day. Thirty nine patients were divided into two groups. Nineteen patients in group-1 continued their aspirin therapy, while 20 patients in group-2 stopped their aspirin regimen 7 days prior to therapy. A total of 6 patients showed increased intra-operative bleeding (4 in group-1 who continued aspirin and 2 in group-2 who stopped aspirin). Suturing and gauze pressure pack was used in all the cases to achieve hemostasis. The additional measure for hemostasis in 6 patients who have increased intra-operative bleeding was tranexamic acid pressure pack. No postoperative bleeding and other complications were reported at 1 week. They suggested that, there is no need to stop aspirin therapy prior to dental extractions which predispose the patient to thromboembolic events.[33]

Partridge et al performed prospective observational study to evaluate the effect of platelet altering medications on bleeding from minor oral surgical procedures. The two groups involved in the study were, experimental group taking platelet altering medications and control group in which platelet altering medications were stopped at least 10 days prior to surgery. The minor oral surgical procedures performed were simple and surgical extractions of the teeth, alveoloplasty, biopsy and frenectomy. Each surgical procedure was assigned units based on surface area of surgical field and anticipated manipulation. Mean blood loss per surgical unit was compared in both groups. In patients who continue aspirin therapy the mean blood loss per surgical unit  $\pm$  standard deviation was  $1.97 \pm 1.48$  gm and is comparable to that in control group ( $1.96 \pm 1.66$  gm). There is no statistically significant difference in relation to amount of blood loss per unit surgical area in both groups. Based on these results they concluded that, patients on platelet altering medications can undergo minor oral surgical procedures without alteration of their medication schedule.

Sonksen et al. performed a clinical study on 52 healthy volunteers taking 7-day course of low-dose aspirin. They found that, after stopping the aspirin, the bleeding time (BT) was less than 10 minutes within 48 hours of stopping the aspirin therapy. Hence, they stated that withdrawal of aspirin for  $\geq 5$  days appears erroneous [34].

Nielsen et al. stated that minor dentoalveolar surgical procedures can be carried out safely without interrupting antithrombotic therapy if INR is within therapeutic range.

Although aspirin and clopidogrel may increase the bleeding risk, the risk of fatal outcome is generally higher if treatment is stopped. They recommended use of local hemostatic measures and tranexamic acid mouthwash [35]

Allard et al. stated that the review of available literature is in favor of not stopping aspirin or clopidogrel in case of simple dental surgical procedures [36].

Krishnan et al. concluded that patient continuing aspirin therapy can undergo routine dental extractions without increased risk of excessive or prolonged bleeding [ 37].

Lillis et al. performed a prospective study to compare the incidence of bleeding complications among patients taking aspirin monotherapy, clopidogrel monotherapy, and dual therapy with both aspirin and clopidogrel and patients not taking aspirin at all. Out of 643 patients enrolled in the study, 111 patients were on antiplatelet therapy: aspirin monotherapy (n = 42), clopidogrel monotherapy (n = 36), and dual

therapy with both aspirin and clopidogrel ( $n = 33$ ). Patients not taking any antiplatelet drugs serve as control ( $n = 532$ ). Teeth were extracted by simple method in all the patients under local anesthesia. To achieve hemostasis, extraction sockets were compressed with digital pressure for 2 minutes followed by sterile gauze pressure pack for 30 minutes. After 30 minutes, patients were reevaluated to look for any bleeding.[38] If present, then a piece of oxidized cellulose (surgicel) was placed in the socket and suturing was done followed by sterile gauze pressure pack for 30 minutes and reevaluation. Patients were discharged after establishing hemostasis. Bleeding if

present was categorized into the following headings.[38]

Cardona-Tortajada et al. involving 155 patients on antiplatelet therapy confirmed that local measures to achieve hemostasis are sufficient to control postoperative hemorrhage after tooth extraction. It is advisable to minimize the surgical trauma by minimizing the number of teeth to be extracted at a time. It has been recommended that three single rooted teeth and two molars either adjacent or corelative to each other should be extracted during a single visit [39].

Morimoto et al. conducted a prospective clinical study involving patients on antithrombotic therapy. Three groups involved in the study were patients on warfarin monotherapy ( $n = 134$ ), patients taking antiplatelet monotherapy (87), and patients taking combination therapy with warfarin and aspirin ( $n = 49$ ). Intra-alveolar extractions of teeth were performed followed by placement of oxidized cellulose in extraction sockets and suturing in all cases to achieve hemostasis. A total of 513 teeth were extracted on 306 occasions. The reported incidence of postoperative bleeding was 3.6%. It includes 7 patients on warfarin monotherapy and 2 on combination therapy. No patient on aspirin monotherapy showed postoperative bleeding. The authors concluded that hemostasis can be achieved easily after tooth extraction in patients on warfarin (INR < 3.0) and antiplatelet therapy [40].

Nooh performed simple and surgical extractions in patients taking aspirin. He compared the bleeding complication in experimental group patients on continued aspirin therapy with control group not taking aspirin. The method to achieve hemostasis includes wet gauze pressure pack for 30 minutes in cases of simple extractions and figure of 8 suturing in case of surgical extractions. Patients on continued aspirin therapy undergone surgical extractions showed mild oozing easily controlled by pressure packs. Based on these findings Nooh concluded that, patients taking 81 mg of aspirin can undergo dental extractions and there is no increased bleeding risk.[41]

Duygu et al performed a clinical study to assess the effect of anti-platelet drugs on risk of bleeding complications after teeth extractions. Simple dental extractions were performed in experimental group patients on continued aspirin therapy ( $n= 25$ ) and control group patients who stopped aspirin 7 days prior to extractions ( $n= 19$ ). The experimental group patients were on aspirin dose in the range of 75-300 mg. Local hemostatic measures were able to maintain primary hemostasis in all cases. There were no intra-operative and post-operative bleeding complications in any case. No statistically significant difference was there between two groups with respect to postoperative bleeding complications. They concluded that, there is no need for interruption of long term aspirin therapy prior to dental extractions. [42]

Park MW et al performed a case controlled study to evaluate the safety of dental extractions in patients with coronary drug eluting stents without stopping multiple anti-platelet agents. A total of 100 patients on multiple anti-platelet agents constituted the experimental group. Out of 100 patients 59 patients were taking dual anti-platelet therapy (aspirin 100 or 200 mg/day plus clopidogrel 75 mg/day) and 41 patients were on triple anti-platelet therapy (aspirin 100 or 200 mg/day plus clopidogrel 75 mg/day plus cilostazol 100 mg/day). A total of 100 matched pairs of patients were used as control group. Hemostasis was achieved by suturing and pressure pack in all the cases. The authors concluded that dental extractions can be performed safely in patients on multiple anti-platelet agents. [43]

Garnier J et al., in a retrospective analysis of 52 patients reported that tooth extraction can be performed without stopping aspirin therapy. A total of 218 teeth were extracted without stopping aspirin therapy. Suturing and pressure pack was used as hemostasis measure in all cases. Only one patient (1.9%) [three extraction sockets (1.3%)] presented with continuous bleeding which require additional local hemostatic measure. No systemic hemostatic measure was required. They concluded that the haemorrhagic risk in patients on aspirin therapy can be managed by local hemostasis protocol. [44]

Adcharyapetch compared the postoperative stoppage of bleeding in subjects who stopped or continued taking aspirin seven days before simple dental extraction. The mean bleeding time in both groups was normal before and after procedure and bleeding stopped in both groups within 30 minutes by biting the gauze, except for 1 patient who required a gauze biting time of between 31 to 60 minutes. They therefore concluded that simple tooth extraction of 1-3 teeth in patients taking low dose aspirin (< 100 mg) could be done without the necessity of stopping aspirin .[45]

Wahl reviewed the literature on this subject in 2000, reporting that in an aggregate of 950 patients receiving continuous anticoagulation therapy, only 12 (< 1.3 percent) required more than local measures to control hemorrhage. The author went on to note that while discontinuation of anticoagulation therapy has been a common practice, bleeding after dental surgery rarely is life-threatening, and, more importantly, there have been four case reports of fatal thromboembolisms resulting from this practice. Loeliger and colleagues<sup>26</sup>, however, have shown that INR values greater than 5.0 are accompanied by an unacceptable risk of serious hemorrhage and patients with INRs greater than 5.0 are not candidates for surgery.[46]

Zanon and colleagues reported the results of a single-blind, prospective study of 250 patients who were receiving anticoagulation therapy and had INR values between 1.8 and 5.0, as well as 265 patients who were not receiving anticoagulation therapy and who underwent both simple and surgical extractions. In all of the procedures in patients receiving anticoagulation therapy, oxidized cellulose was placed in the surgical site and stabilized with silk sutures, tranexamic acid-saturated gauze square was placed for 30 to 60 minutes, and an ice pack was placed on the cheek for one hour postoperatively. The total number of bleeding complications in the group of patients receiving anticoagulation therapy (four out of 250) did not differ significantly from the rate of occurrence in the control group (three out of 250).[47]

Pereira CM et al conducted a study with 108 patients. 215 extractions were performed in which only one case of postoperative bleeding occurred. Warfarin was used by 98 patients; Warfarin associated with salicylic acetic acid by 9 patients and salicylic acetic acid in only 1 patient. INR ranged from 0.8 to 4.9, with a mean of 3.15. They concluded that extractions in patients on oral anticoagulants must be performed in the least traumatic manner possible. It is not necessary to stop anticoagulant therapy prior to teeth extractions. Local hemostasis techniques, such as sutures alone are sufficient to prevent hemorrhagic complications.[48]

### **III. Discussion**

The management of a patient on aspirin therapy for cardiovascular diseases who have to undergo oral surgical procedures is a topic of concern to the oral surgeon as there is a potential risk for excessive bleeding after a surgical procedure, even if it is an uncomplicated extraction of teeth. This is attributed to the antiplatelet action of aspirin.[1,2,3,5,7]

Aspirin even at low doses of about 0.5-1mg /kg per day tends to inhibit platelet function for the entire lifespan of the platelet which is approximately 10 days. This is used to an advantage by a physician to prevent intravascular thrombosis without eliciting the possible side effects of high doses of aspirin.

Patient's inherent factors which can increase the risk of bleeding must be identified prior to invasive surgical procedure. Patient's demographic risk factors include advanced age and female sex. Additional patient related risk factors include obesity, hypertension, diabetes mellitus, haemostatic disorders, renal impairment or failure, and other major organ system failures . [1,3,6,7,9]

Only considering the positive studies in favor of continuing aspirin and ignoring the potential risk associated with aspirin use is not a sound scientific principle. Therefore, a discussion regarding negative reports indicating potential risk of bleeding with aspirin use is essential.[1,4,8,9]

Elad et al. reported a case of severe life threatening bleeding episode following nonsurgical periodontal treatment in a patient taking dual antiplatelet therapy. This 56-year-old female patient has multiple systemic illnesses like ischemic heart disease, hypertension, and diabetes [50]. Advanced age, female sex, hypertension, and diabetes are patient's inherent risk factors [8, 80] and periodontal problem is

local risk factor [64] which were not at all considered by the authors. The authors should have considered additional local and systemic measures preoperatively to avoid such life threatening complication. With respect to severity of the complication, we may consider it as a single case of significant postoperative complication.[49]

Lillis et al. further stated that local inflammation (in relation to site of tooth extraction) is characterized by hyperemia along with possible fragility of blood vessels that might predispose to postextraction bleeding. Therefore, patients

taking aspirin therapy and requiring extraction of periodontally involved teeth must be considered as high risk group with more probability to develop bleeding postoperatively. Appropriate hemostatic measures should be used in these patients [38].

Brennan et al. (2008) studied 36 patients divided into two groups: Group 1 patients received 325 mg ASA daily and Group 2 served as control. They investigated the bleeding time. No significant differences were found between the two groups

in the bleeding time. They recommended not stopping ASA before the surgical procedure.[50]

Thomason has excessive postoperative bleeding after gingivectomy in maxillary anterior segment. This patient was treated by renal transplant and had decreased

platelet count . Renal failure is considered as patient's inherent risk factor which predispose to postsurgical bleeding (not considered by the author) .Therefore, it is difficult to consider altered platelet activity induced by aspirin as the single responsible factor when other risk factors like decreased platelet count and renal failure were also present. In the same patient, initial gingivectomy procedure in mandibular anterior region was uneventful. It is not clear how the same patient with same invasiveness of surgical procedure responded differently[19].

Scher found continuous diffuse bleeding after surgery in patients taking aspirin therapy . However, the patients involved in their study were taking much higher doses of aspirin [ 18].

Bartlett (1999) investigated minor and significant complications after cutaneous minor surgery. The study was designed to have two groups. Group one with 52 patients who continued ASA whereas 119 patients served as a control group. The results indicated that 1.9% demonstrated minor complication in ASA users versus 3.3% in the control group. However, the significant complication was 3.8% in ASA user and 4.2 in the control group (Bartlett, 1999). The finding indicated that

ASA use did not cause post-surgical complications similar to the findings of the present study. [51]

Sonis et al further stated that only the production of newer platelets will be able to overcome the inhibiting effect of aspirin<sup>27</sup>. Few other authors recommended stopping aspirin for 3 days or lesser than that<sup>28, 29, 30</sup>. The rationale for such recommendation is that, after 3 days of interruption of aspirin, sufficient number of newer platelets will be present in the circulation for effective hemostasis .[52]

From the above description, it can be concluded that increased bleeding on probing as reported by Schrodi et al. [46] and Royzman et al. [47] was not solely due to aspirin use. Local risk factor (periodontitis) leads to hypermeia which adds to increased incidence of bleeding on probing in these patients.[21,22]

Murphy et al. concluded in their survey that 86% of the dental practitioners who advised patients to stop taking antiplatelet drugs prior to dental extraction did so with the consultation of the patients' physicians, and found that the protocol followed by the physicians and dentists was not based on the current recommendations and guidelines[.53]

Accordingly, Mak S. and Amoroso P. recommended discontinuation of antiplatelet therapy on urological surgical treatment because of the possibility of bleeding after procedures such as prostatectomy [54]

Richardson et al., also argued in favour of the discontinuation of antiplatelet therapy for 7 days before scheduled surgical procedures [55]. In the cardiac surgery, discontinuation of ASA therapy seven days prior to the planned treatment was considered as the standard, due to the possibility of complications such as bleeding and the need for re-operation or blood transfusion [56]. However, Bybee KA., et al., conducted a prospective study of 1636 patients who underwent isolated CABG (coronary artery bypass grafting). In the study, 1316 patients received ASA within 5 days prior to cardiac surgery, while 320 patients discontinued ASA therapy. All patients received 6 hours after surgery an oral dose of 81 mg ASA and 325 mg 24 hours after surgery. Tranexamic acid was routinely used intraoperatively. In the whole study group 36 deaths and 48 cases of cerebral complications were recorded. It was shown that the use of preoperative ASA significantly reduced the risk of postoperative mortality and stroke compared with the group in which such procedures were not applied (1.7% to 4.4%) [57]. Other studies by Samama CM., et al., [58] strongly supports the view of maintaining antiplatelet therapy before surgery with reference to the guidelines of the French Society of Anesthesiology and Intensive Care.

The INR for a healthy patient is 1 and the therapeutic INR for those on anticoagulant therapy typically ranges from 2 to 4, depending on the reason for anticoagulation. In the past decade, it has become clear that routine discontinuation of oral anticoagulant therapy for dental procedures is not supported by the scientific literature, as it may put patients at unnecessary medical risk for thromboembolic events either from the cessation of anticoagulant therapy or because of "rebound phenomenon." Currently, most guidelines indicate that patients with an INR less than 3.5 can undergo minor oral surgery (e.g., simple single extraction) without any adjustment in anticoagulation. Withdrawal or temporary interruption of anticoagulant medication, could lead to thromboembolic events. INR values should be obtained within 24 hours before the dental procedure. For patients with INR in the therapeutic range 2-4 or below, therapy need not be modified or discontinued for simple single dental extractions. More complicated and invasive oral surgical procedures for patients with an INR on the high end of the scale or greater than 3.5 should be referred to physician for dose adjustment or therapy alteration before invasive dental procedures. risk of thromboembolism on stopping oral anticoagulants outweighs the risk of postoperative bleeding on continuing oral anticoagulants.

The risk of bleeding may be minimized by use of oxidized cellulose or collagen sponges, fibrin sealants and Tranexamic acid mouthwashes used four times a day for 2 days. The use of concomitant medications, including antibiotics, antifungals, nonsteroidal anti-inflammatory drugs (NSAIDs), and other platelet aggregation inhibitors may affect a patient's ability to achieve adequate haemostasis after a routine dental procedure.

There are various authors who recommended not stopping aspirin therapy prior to dental extraction . There is no indication to stop aspirin therapy prior to invasive dental procedures as any postoperative bleeding if present can be easily managed by local hemostatic measures . Oral hemostatic measures can be taken to control bleeding after tooth extraction by suturing the socket and by packing gauze bite firmly for 15-30 minutes<sup>33</sup>. Resorbable gelatin sponge, oxidized cellulose, microfibrillar collagen can also be used. If still bleeds, tranexamic acid can be applied topically [59]. There are also several other factors that needs to be assessed in patients undergoing anti platelet therapy prior to invasive surgical procedure such as patient's inherent risk factors for bleeding, invasive potential of the surgical procedure, and potential risk of thromboembolic event if antiplatelet therapy is stopped<sup>35</sup>. Therefore, it is advised that a dental clinician should take into consideration all the above said factors before decision making. It is also advised to take physician's opinion before the surgical procedure.[59,60]

#### **IV. Conclusion**

Low-dose aspirin (75 - 150 mg) therapy should not be stopped before oral surgery. Local haemostasis is sufficient to control bleeding. Patients receiving aspirin therapy to prevent blood clot formation may be subject to emboli formation if the treatment is stopped. The results of this study show that aspirin therapy should be continued throughout oral surgical procedures.

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