Table 1. The Effect of Halothane at Clinical Concentrations on Platelet Aggregation in Vitro

Authors	Material	Agonist	Aggregation
Ueda (1971)[5]	canine	ADP	↓
Bjoraker (1979)[6]	human	ADP	–
Dalsgaard-Nielsen and Gormsen (1980)[7]	human	ADP	↓
Walter et al. (1980)[8]	human	ADP	↓
Bertha et al. (1990)[9]	human	ADP, Epi, collagen, AA	↓
Hirakata et al. (1995)[10]	human	ADP, Epi, thrombin, STA_2	↓
Kohro and Yamakage (1996)[11]	human	thrombin	↓
Corbin et al. (1998)[12]	human	thrombin, U46619	↓

Notes: ↓, decreased; –, no change; ADP, adenosine diphosphate; Epi, epinephrine; AA, arachidonic acid; STA_2, a thromboxane A_2 analog; U46619, a thromboxane A_2 receptor agonist.

Table 2. The Effect of Halothane at Clinical Concentrations on Platelet Aggregation in Vivo

Authors	Type of surgery	No. of patients	Aggregation	Bleeding time
O'Brien et al. (1971)[13]	thoracic	10	↓	NA
Kokores et al. (1977)[14]	abdominal	15	↓	↑
Lichtenfeld et al. (1979)[15]	gynecological	12	–	NA
Dalsgaard-Nielsen et al. (1981)[16]	orthopedic	10	↓	↑
Fyman et al. (1984)[17]	minor	51	NA	↑
Sweeney and Williams (1987)[18]	craniofacial	9	↓	NA
Sweeney and Williams (1987)[18]	dental	9	↓	NA

Notes: ↓, decreased; –, no change; ↑, increased; NA, not available.

platelet uptake on the grafts. In 1989, Bertha et al.[20] reported the effect of halothane on acute thrombus formation in artificially stenosed coronary arteries in dogs. Halothane was postulated to have a protective effect against acute thrombus formation in stenosed coronary arteries. A recent study by Heindl et al.[21] using a model of isolated guinea pig hearts showed that halothane could reduce the adhesion of platelets in the coronary system under low-flow conditions.

Investigators have tried to postulate the possible mechanism for the inhibitory effect of halothane (Table 3). Over the last 5 years, there have been considerable advances in the evaluation of platelet function. A consensus has been reached from these recent studies.[10-12,23,24] The action site of halothane localizes at the TXA_2 receptors on the platelet membrane. By reducing the TXA_2 receptor-binding affinity at the ligand binding site, halothane modulates TXA_2 receptor signaling. Consequently G protein-coupled PLCβ will not be activated, and hence the downstream IP_3 and DAG are reduced. The final result is a decreased intracellular calcium concentration, which plays a vital role in platelet aggregation.

Sevoflurane is another volatile anesthetic demonstrated to have inhibitory effects on platelet function.[25-27] Sevoflurane exerts its effect differently from halothane. Sevoflurane inhibits platelet TXA_2 formation by suppressing cyclooxygenase activity but does not interfere with TXA_2 receptor-binding affinity.

The other 3 volatile anesthetics, enflurane,[28,29] isoflurane,[27,30,31] and desflurane,[31] appear to have minimal or negligible effects on platelet function. There is no evidence that these 3 volatile anesthetics affect platelet aggregation at concentrations used clinically.

INTRAVENOUS ANESTHETICS

Barbiturates, including pentobarbital, methohexital, and thiopental, have been investigated both in vivo and in vitro. The results show that human platelet aggregation is not altered by barbiturates.[32,33] However, a recent study by Parolari et al.[34] demonstrated that thiopental at therapeutic concentrations inhibited platelet activation in patients undergoing cardiac surgery. The