Experimental Study on Diethyl Ether Anesthesia

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Diethyl ether was first described by Valerius Cordus in 1540, and it is generally agreed that Crawford Long used ether for 3 surgical patients in 1842, and Morton subsequently gave a definitive public demonstration in Boston in October, 1846. After this, ether use became widely published and the news spread to London, where Drs. Boot and Squires soon used it on surgical cases at University College Hospital. The importance and volume of diethyl ether in the anesthesia field grew day by day and year by year and it is widely used by various techniques.

But, during the past decade, the frequency of usage of diethyl ether has declined and it is now hard to find new articles on diethyl ether. The reason is that the experience of induction is most unpleasant and stormy with secretions, vomiting and laryngospasm; also, excessive depth is often produced and in the post operative course, headache, nausea, vomiting and fluid or electrolyte disorders may follow. Another reason is the production of various new inhalation anesthetics.

Today, many serious complications of new anesthetics are reported; especially halothane may have a hepato-sensitive effect (Burnup 1958, Virtue 1958, Barton 1959, Temple 1962 and Bunker 1963) and new recent articles were published by McArdle (1968), Oyama(1969) and Markello (1969).

It should also be remembered that, although its use in clinical practice in Britain and other Western parts is now almost as limited as chloroform, ether is still the main inhalational anesthetic in many parts of the world, because diethyl ether is still an excellent anesthetic safer and perhaps more inexpensive than any other.

Since diethyl ether has recently been produced in Korea, objectives of the study were mainly reevaluation of the effects of diethyl ether through experimental animal studies.

Nine healthy normal dogs weighing approximately 10 kg. body weight were employed in this experiment and 4 dogs (group 1) anesthetized with Squibb ether and 5 dogs (group 2) with Korean made ether, were used for the study. Endotracheal intubation was done under light sedation with pentobarbital sodium 30mg/kg I.V. and the tube connected with a Ruben valve; Nonbreathing system which could be applied O₂ 0.3 to 0.5 L/min. through the Heidbrink Ohio Chemical Anesthesia Apparatus without any anesthetics.

Cannulations were applied into the right jugular vein for C.V.P. into the femoral artery for arterial pressure, the femoral vein for fluid infusion which contained Inulin and B.S.P. (priming doses were 50 mg/kg and 5 mg/kg and maintenance doses were 0.25 mg/kg/min. and 0.05 mg/kg/min.) using the
Harvard infusion pump (2 ml/min.), the other femoral artery for blood sampling, both ureters for urine collection, and the common bile duct for bile collection.

A Polygraph Grass Type 4 Channel Machine was connected for E.E.G., E.C.G., C.V.P. and arterial pressure.

During the whole of the study, E.E.G., E.C.G., arterial pressure, C.V.P. and arterial blood sampling for PaCO₂, PaO₂, pH and hemoglobin, and urine collection for Inulin clearance and bile collection for B.S.P. clearance were done every 20 minutes through a 4 hours (one hour for the pre-anesthetic period, two hours for the anesthesia period, and one hour for the post-anesthetic period.).

Arterial blood gas, and pH were analyzed with a Radiometer, hemoglobin by the hemophotometer, Inulin clearance by the Schreiner method and B.S.P. clearance by the Pitt acton method.

After the post-anesthetic period, tissue specimens; the heart, lung, liver and kidney, were fixed in 10% formalin and stained with hematoxylin and eosin for histopathological study.

Results and Summary

An E.C.G. tracing with pulse rate, arterial pressure and C.V.P. were not changed significantly during ether anesthesia in dogs.

Within the first 60 minutes during ether anesthesia, PaO₂ were evaluated but after that gradually declined until post-anesthetic period. PaCO₂, pH and hemoglobin values did not show any remarkable change in all experiments.

B.S.P. and Inulin clearances during ether anesthesia were decreased but recovered slightly in the post-anesthetic period.

Histopathologically, in a few dogs, a slight alveolar edema, capillary congestion, alveolar wall thickening, mucusal degeneration, destruction of bronchioles in the lung and glomerular ischemic changes in the kidney were observed. No other pathological findings in the heart and liver were found.

論 論

1730年 Frobeniusに依って spiritus aetherius라고紹介され、此蒸発性吸収麻酔薬は15世紀頃 paracelusが ethyl alcoholに黄薬を混合、脱水し蒸発させて、次いでに erhyl etherを合成するようになった。1540年に Valerius cordesに依って記述された。その後の麻酔作用は19世紀初めに Priestley, Bedds及び Davy等に依って著しく位置をすめ、1841年に Crawford Long in Georgia, Jeffersonに依って自己に麻酔実験に使用して、その著しく手術の患者3例を麻酔するに成功したが、不幸にして命を失って、その後の著者も行っ、1845年に William Morton がBostonのMassachusetts 総合病院で行っ、有名な ether 茶麻薬の公開実験にて成功したので、全世界的に普及するに至った。

Etherの薬理学的作用は他麻酔薬の比較の基準に位置し、それら etherが成立するとは現代麻酔科学の歴史として説明されていない。Etherは直接的に安全であると、強力に、充分な筋肉弛緩作用を、有効な、優秀な麻酔作用と、開放、非開放、非閉鎖及び閉鎖式等の各種吸入方法の投与が可能な点、そして経済的である。