SHORT COMMUNICATION

Effect of Smoking on Drugs

Roaya M Al-Abbasi*

A drug interaction occurs whenever the presence of one chemical substance changes the pharmacokinetics or the pharmacodynamics of a concomitantly administered drug.

Many doctors are unaware of the risks to which their smoking patients are exposed when treated with certain drugs.

Cigarette smoking induces alteration in absorption, distribution, metabolism and excretion of some drugs. It may also impose changes on the cardiovascular, immune and haemostatic systems.

Several investigations have suggested that smoking induces drug metabolism in the liver. Consequently certain therapeutic agents are metabolised more rapidly than others, thus reducing their pharmacological effects.

The rate of metabolism of agents taken while smoking increases, with consequent decreased therapeutic response. This article is a short review of this subject.

The overriding pharmacokinetic effect of cigarette smoking is the induction of drug-metabolising enzymes. Enzyme inducers present in cigarette smoke are nicotine and some pesticides. Infact, nicotine and other constituents of cigarette smoke-cadmium, carbon monoxide, hydrogen cyanide and pesticides can inhibit enzyme activity.

Cigarette constituents may potentiate or antagonize the desired pharmacological effects of medications inhibit diuresis, elevate blood pressure, cause tachycardia and other arrhythmias, stimulate the central nervous system, increase gastrointestinal tone, induce vasospasm, antagonise ulcer healing, and alter blood flow to the skin.

In addition, smoking decreases pain tolerance, increases the need for analgesics, promote hyperlipidemia, relaxes the skeletal muscle and prevent panic attacks.

Drugs which are affected by smoking fall mainly in these groups:

1. Analgesics
2. Psychoactive Drugs
3. Hypoglycaemic Agents
4. Anticoagulants
5. Oral contraceptives
6. Lidocaine
7. Theophylline
8. Glutethimide

* Pharmacist
BDF Hospital
State of Bahrain

1. **Analgesics**

In a study of 66,410 subjects, standardised mechanical pressure was applied to determine pain tolerance. Both male and female white smokers had significantly less pain tolerance than white nonsmokers. There was no difference between smokers and nonsmokers in black males and females. Thus, independent of sex, pain was less well tolerated by white smokers[1]. Therefore, at least for the white population, smoking is associated with need for a higher dosage of analgesics.

2. **Psychoactive Drugs**

Nicotine is psychoactive and readily crosses the blood brain barrier. It has the ability to reduce anxiety, relax skeletal muscle, and relieve panic attacks.

Example Benzodiazepines: An epidemiologic study of the incidence of drowsiness due to chlordiazepoxide (librium) and diazepam (valium) showed that drowsiness was less likely to occur in smokers than non-smokers. This effect is directly proportional to the number of cigarettes smoked per day[3,4].

3. **Hypoglycaemic Agents**

Smoking may result in increased glucose concentration, smokers need on average 15-20% more insulin than non-smokers. This difference may be related to impaired absorption of insulin due to alterations in blood flow after smoking[3]. Smoking may affect the control of diabetes by altering pharmacodynamic factors. In addition Nicotine stimulates the release of epinephrine and non-epinephrine which causes the serum cortisol concentration to rise.

4. **Anticoagulants**

In a study of factors affecting heparin pharmacokinetics in 20 patients with thromboembolic disease, it was found that smokers had shorter heparin half lives (0.62 hours versus 0.97 hours) and more rapid heparin elimination rates than non-smokers[1,5], indicating a need for higher anticoagulant dosage.

5. **Oral Contraceptives**

Cigarette smoking increases the risk of serious adverse effects on the heart and blood vessels from oral contraceptive use[3]. The risk increases with age and heavy smoking (15 or more cigarettes/day).

Women who use birth control pills and smoke have three times greater chance of dying of heart attack than women who take pills but do not smoke.

6. **Lidocaine**

It was found that the mean free fraction of lidocaine was 0.28 in eight smokers and 0.37 in eight non-smokers. This difference was due to a decreased concentration of acid glycoprotein in smokers[1].

I V Lidocaine probably has a similar disposition in smokers and non-smokers.

7. **Theophylline**

Cigarette smoking significantly enhances the elimination of theophylline thus increasing theophylline dosage requirements. Adverse reactions to theophylline occur less frequently in smokers than in non-smokers. A sustained release preparation of theophylline would be more appropriate for patients who smoke to avoid excessive fluctuations in theophylline concentrations in the blood[4].

8. **Glutethimide**

Smoking may increase the effect of glutethimide but confirmation is needed[3].

SMOKING BEFORE SURGERY

Cigarette components which are responsible for long term cardiovascular problems are carbon monoxide and nicotine carbon monoxide reduces tissue oxygenation by two mechanisms:- It reduces the amount of haemoglobin available for combination with oxygen because of the formation of carboxyhaemoglobin, and increases the affinity of haemoglobin for oxygen. It also has a weak negative inotropic action on the heart.

Nicotine increases the demand of the myocardium for oxygen while carbonmonoxide decreases the supply. A period of absence from smoking for 12-24 hours preoperatively will allow the elimination of both carbonmonoxide and nicotine, and will improve cardiovascular fitness.

CONCLUSION

Cigarette smoking can affect the pharmacokinetic

and pharmacodynamic properties of drugs. It may either increase the hepatic metabolism of some drugs which decreases their therapeutic levels in the blood, thus necessitating higher doses; or decrease the hepatic metabolism of other drugs, which leads to an increase in the concentration of these drugs in the blood, thus requiring a smaller dosage.

The heterogeneous nature of cigarette smoke and the variability in smoking behaviour, make it difficult to predict the effect of smoking on drugs therapy.

Doctors and pharmacists should inform patients about the possible complications of taking drugs while smoking and advise them to, at least, stop smoking while on medication with any of the above mentioned groups of drugs.

REFERENCES

1. Miller GM. Cigarette and drug therapy; pharmacokinetic and pharmacodynamic considerations. Clin Pharm 1990;9:125-35.

2. Covington T, Dipalma J, Hussar D, et al. Facts & Comparisons. WPP 1981;581:920-1.

3. Hansten P, Horn J. Drug Interation. 6th ed. Washington, 1989: 400-15.

4. Griffin J, D'Arcy P. A Manual of Adverse Drug Interaction. 3rd ed. Bristol, 1984:238-348.

5. Reynolds J. Martindale the Extra Pharmacopia. 29th ed. London, 1989:355-1532.

6. Osol A, Chase G, Gibson M, et al. Remington's Pharmaceutical Sciences. 16th ed. Washington, 1980:1743-55.

7. Smoking before Surgery. Br Med J 1985;290:1607-78.