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The potential toxicity of loop diuretics in patients with cardiovascular complications

Grzegorz Liczner[1], Michał Wiciński[1], Bartosz Malinowski[1], Mateusz Ozorowski[1], Karolina Długi[1], Sebastian Rewerski[1]

[1]Department of Pharmacology and Therapeutics, Faculty of Medicine, Medical College in Bydgoszcz, Nicolaus Copernicus University, M. Curie 9, 85-090 Bydgoszcz, Poland

Abstract

A patient with cardiovascular complications is a proper candidate for a diuretic treatment. Here, loop diuretics are the drugs with the greatest strength and time of acting, especially when used in urgent cases like exacerbation of heart failure is overhydration due, pulmonary edema and renal failure. Conducting treatment in Those conditions and the physician should keep in mind and rational dosage of drugs mentioned, the interactions with others and also medicaments patient's comorbidities. Besides of advantages With diuretic treatment, in still observe Increasing the number of its side effects, Which are the real threat for patients' life.

Key words: loop diuretics, furosemide, torasemide

Admission

Overhydration is one of the main causes of hospitalization, causing exacerbation of heart failure and cardiac decompensation, running often in the form of pulmonary edema [1]. Preferred drugs given to patients with these diseases are loop diuretics, which are flagship representatives of furosemide and torasemide - the strongest diuretics identical mechanism of action. It is based on a reduction in pre-load through relaxation of peripheral venous and pulmonary venous circulation [2] by producing vasodilatory prostaglandin and nitric oxide. Because of the synthesis of prostaglandins following the increase in GFR and an increase in diuretic effect [9]. The point holder diuretics with a molecular point of view cotransporter Na + -K + -2Cl-walled portion in the upstream arm of the loop of Henle of nephron blockade inhibits the absorption of the active chlorine ions and by coupling the ionic - sodium and water, which in turn increases the osmotic fluid excretion by the kidneys [1]. Vasodilating action ahead of the diuretic effect of these drugs [6]. Loop diuretics in chemical structure are derived from sulfamylobenzoesowego, which thanks to the presence of the sulfonamide group may be the cause of the photo allergic reaction. Knowledge of the mechanism of action, loop diuretics and their chemical structures are crucial in understanding the adverse effects of these drugs.

Differences between furosemide and torasemide

Furosemide is an acid sulfamylobenzoesowego that more than 95% is bound to plasma proteins [1], and its oral bioavailability is 55% on average. The duration of action is determined in the range of 4-8 hours with a peak at 2-h administration, the effect of the disclosed 20 minutes after oral administration of the drug. Furosemide is metabolized primarily in the kidney, a much lesser extent the gastrointestinal tract - 97% is excreted in the urine, and only 3% in the bile. Torasemide is anilinopirydynową while sulfonylurea [1], which binds almost completely plasma proteins (99%) and has a high bioavailability (approximately 80%). The drug has more than furosemide (6-12 h), and is 4 times more potent than its competitor [7]. Time of maximal concentration in plasma is similar to that of furosemide and is 1-2 hours. Due to metabolism in the liver, is excreted primarily in the bile - 80%, while 20% excretion [5]. The clinical observation points more stable in serum potassium levels compared with furosemide, which is desirable in patients with hypokalemia. This prevents the need to supplement this element, and thus, additional burdens on the patient's fluids. Torasemide due to the much longer running time is more preferred drug on the need to force diuresis sustained, but not violent. It is a convenient drug, it does not require repeated administration of the diuretic therapy.

The effectiveness of the two drugs were compared in the study TORIC - torasemide in Congestive Heart Failure Study, which included 1,377 patients with heart failure in NYHA class II and III. The patients were given 10 mg of torasemide and furosemide 40 mg [8]. In the group of patients treated with torasemide had a significantly lower annual mortality rate with cardiovascular compared with the group treated with furosemide (2.2% vs 4.5%, $p < 0.05$). It has also been shown clinical improvement based of NYHA classification, showing improvement in frequent than furosemide torasemide group (45.8% vs. 37.2%). In the group of torasemide significantly less frequently hypokalemia (12.9% vs 17.9%, $p < 0.013$) [1,8].

Indications

Loop diuretics in clinical practice are an important element of the treatment of patients of chronic heart failure of NYHA functional class II-IV. Are recommended for patients with signs of congestion, regardless of left ventricular ejection fraction [4]. The primary indication for their use is the fluid overload causing exacerbation of heart failure, and treatment of severe renal creatinine clearance < 20 mL / min and / or serum creatinine > 6 mg / 100 ml. Furosemide and torasemide are also alternative combination to treat hypertension, end-stage liver failure etiology cirrhotic and during the application of forced diuresis [3,10].

Side effects

The most commonly reported adverse effects of loop diuretics include electrolyte disturbances, of which special attention should be paid to hypokalemia. The severity is proportional to the dose and duration of treatment [9]. It is accompanied by hypomagnesemia often hinders the alignment of the former. these dyselektrolitemie greatly aggravate existing arrhythmias in patients, disorder or reveal any, de novo. An example is a paroxysmal atrial fibrillation or fixed, which often leads to fast cardiac decompensation. It has also been frequently ratcheting effect of digoxin toxicity in patients with hypokalemia by with cardiac arrhythmias. Digoxin as a drug with a narrow therapeutic index requires the monitoring and correction of the concentrations of potassium and calcium in blood serum. Often bradycardia was observed in patients with atrial fibrillation digoxin, who during treatment diuretic furosemide developed hipokaliemię. W this situation, it is recommended that correction of electrolyte abnormalities and exchange furosemide torasemide more secure.

Electrolyte abnormalities in śródchłonce are a significant cause of hearing impairment in a large number of patients treated with intravenous infusions of furosemide [9]. Its severity depends

on the speed and size of the infusion diuretic glomerular filtration rate, as furosemide the majority is metabolized in the kidneys.

Loop diuretics are the second group of drugs aminoglycosides the most impressive effect ototoxic. Cause deafness type receiving usually reversible. Irreversible hearing damage has been reported in patients treated with acid etakrynowym [1.10].

Quick supply furosemide can cause pulmonary edema via a component of diastolic venous and then the perceived component of a diuretic, too fast reduction of cardiac preload. The consequence of this phenomenon is orthostatic hypotension, hypovolemia and reflex tachycardia. Clinically manifest themselves as syncope, syncope, fall from their consequences as mechanical damage. He rarely mentions unfortunately for living patients taking loop diuretics, and they receive them active people, getting younger applicants to impotence and sexual dysfunction. Loop diuretics are the second most common cause of sexual dysfunction after β - blockers among antihypertensive drugs observed in the family doctor's office.

In addition to action ototoxicity loop diuretics may have also nephrotoxicity. Hypovolemia and hypotension favoring renal ischemia, damage them przednerkowym mechanism or acute interstitial nephritis. Increased risk of nephrotoxicity with concomitant use of loop diuretics cephalosporins and second generation aminoglycosides and [9]. Cephalosporins have the ability to crystallize in the renal tubules, which may impair glomerular filtration and compacting the primary urine. Filtration and reduction in renal ischemia increases and RAAS and enhance the production of vasopressin [9].

The last side effect of loop diuretics discussed in this article the effect of these drugs on carbohydrate metabolism and perceived as glucose intolerance or overt diabetes mellitus, inclusive. It has been proven, hypovolemia that by reducing the blood perfusion by skeletal muscle increases the distance of insulin which has to overcome the lumen of the vessels to the cell membrane of myocytes. Other mechanisms by which diuretics lead to disturbances in carbohydrate metabolism include increasing gluconeogenesis, inhibition of insulin secretion, stimulation of the sympathetic nervous system. Please refer to hypokalemia, which is a factor that hinders proper secretion of insulin from pancreatic islet cells of the pancreas in response to a stimulus tract. Transitional side effect in the first weeks of treatment loop diuretics include disorders of lipid metabolism in the form of increase in the fraction of LDL and VLDL. Factors contributing to this are the above-described carbohydrate metabolism disorders and hormonal, hypokalemia, and insulin resistance [9].

Conclusions

1. Loop diuretics are still preferred diuretics in the treatment of acute medicine, primarily in the exacerbation of chronic heart failure with symptoms of fluid and severe renal impairment.
2. In clinical practice, the drug furosemide diuresis trigger violent, short-term, torasemide and allows correct water and electrolyte disturbances more stable and longer.
3. The benefits of treatment with loop diuretics in patients with cardiovascular burdens outweigh the risk of side effects, although torasemide seems to be a safer drug than furosemide. However, the implementation of intensive dewatering requires an individual approach to the patient's comorbidities and are taking his medication.

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