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SHORT COMMUNICATION OPEN ACCESS

Efficacy, usage and adverse effects of furosemide in cardiovascular diseases

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Abstract

Cardiovascular diseases can be caused by numerous beginning conditions. The underpinning causes may include heart/ myocardial inflammation, cardio myopathy, coronary vascular complaint (CAD), dyslipidemia, hypertension, pulmonary hypertension, and arrhythmia, which may eventually affect heart and liver failure. The study was aimed to determine the efficacy, usage and adverse effects of furosemide in diseased heart conditions. Furosemide is prescribed in the treatment of various cardiovascular illnesses, including monitoring the effects in various age groups, gender and body weights. Considering all the primary parameters of drug dose and secondary parameters of dose duration and their certain categories, we evaluate the results based on the effectiveness of furosemide. The collected and gathered data is analyzed by the suitable statistical methods (Central tendency methods) like Arithmetic mean. The effectiveness of furosemide is rapid and strong in the age group of 39-69yrs with the sodium levels of 132.8mEq/L and the urine output of 2.23L/day. The drug shows potential adverse effects like Ototoxicity, skin irritations and stomach cramps, in people with existing heart conditions. The usage of furosemide is beneficial in heart patients however some people show some potential adverse effects. The drug poses its potential side effects only when the usage is high or in unauthorized dose and also depends on previously existed disease conditions.

Keywords: furosemide; cardiovascular diseases; heart failure; ototoxicity; skin irritations; arithmetic mean; hepatic failure

Introduction

Heart failure is diagnosed when the heart is incapable to pump and fill the blood at a sufficient rate to meet metabolic demands of mortal body due to abnormal cardiac functions. The inadequacy of blood to pump leads to fluid accumulation in the legs, stomach, upper, and lower body. Heart failure is caused by numerous beginning conditions that affect the heart deconstruction. The underpinning causes may include heart/myocardial inflammation, cardiomyopathy, coronary vascular complaint (CAD), dyslipidemia, hypertension, pulmonary hypertension, and arrhythmia heart failure may eventually affect in order and liver failure [1, 2].

Heart failure may not develop symptoms directly. It is one of the leading causes of morbidity & mortality. Encyclopedically, it is among the primary causes of illness and death. Heart failure cases suffer from variety of symptoms that alarmingly impact their quality of life, like shortness of breath, fluid accumulation (legs, ankle and stomach) frazzle, dropped exercise forbearance and irregular heartbeat [3, 4].

Furosemide is a diuretic medication that is classified as a loop diuretic (aka water pill) and is primarily used to treat elimination of fluid accumulation in the body (edema). It is derived from anthracitic acid, which can also be used to treat hepatic failure, kidney failure and Hypertension. It starts dehydration in the body by

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restriction of reabsorption of the electrolytes. It has a fast amusement, short life of action, and can be safely used in all cases (pediatrics, grownups, Geriatrics) [5]. Furosemide is available in different dosage forms like oral, IV (intraventricular) and IM (intra-muscular). The administration depends upon the condition of the person [6, 7]. Furosemide restricts the reabsorption of sodium and chloride ions in the PCT, DCT and thick ascending loop of Henle by ceasing the sodium & chloride co-transport system. This result in the elimination of Na+, Cl-, Ca+ and Mg+ ions [8].

In basic terms, when a patient administered with furosemide, through oral or parental dose, it causes excretion of sodium in urine. Patients with extra cellular volume expansion, who has never been administered with furosemide, the primary dose of the furosemide causes large amount of sodium elimination and diuresis within 3-6 hours. After the drug losses its potential, the sodium and chloride ions starts retaining in the kidney and this phenomenon is called "Post-diuretic sodium retention". Therefore, the drug administration should be repeated at regular intervals of 6-8hours to retain sodium and maintain diuresis. In a normal individual and a patient, the ECF expansion shows a linear relationship with natriuretic while receiving furosemide; it suggests that patient's natriuretic and output of urine increases with ECF expansion when compared to normal individual with normal ECF expansion volume. As the drug use becomes chronic in patient [9], ECF volume goes down and the level of natriuretic also decreases. It suggests that, the amount of sodium excretion equals with the sodium intake; this phenomenon is also called breaking phenomenon [10]. Common adverse effects of furosemide were constipation, headache, loss of appetite**,** blurred vision**,** diarrhea**,** dizziness [11]

Potential adverse effects of furosemide: Ringing in ears -muscle contractions or spasms**,** unusual bleeding**,** lightheadedness**,** increased thirst**,** dry mouth**,** increased urination**,** hearing loss (Ototoxicity)**, s**welling in your ankle or feet**,** shortness of breath (SOB), upper stomach pain - irregular heartbeats**,** muscle weakening or limp feeling**,** numbness or tingling - nausea &vomiting's**,** flutters in your chest [24].

The study was aimed to determine the efficacy, usage and adverse effects of furosemide in diseased heart conditions.

Material and methods

In this study 74 subjects were included, who were prescribed with furosemide. This includes in –patient and out- patient units at Krishna Institute of Medical Science, Secunderabad. IV/IM starting dose was 20-40mg once, and it was increased up to 100mg after 2hrs whenever it was required. Oral starting dose was 20-80mg once, and it was increased up to 120mg after 6-8hrs of starting dose. Max dose should not exceed 600mg/day in the treatment of edematous states.

Inclusion criteria: Adults**;** both male & female patients**;** diseased heart patients**;** diseased kidney patients**;** outpatients**;** patients giving their informed consent.

Exclusion criteria: Children & young patients (<18yrs old)**;** pregnant & lactating women**;** patients who are not giving their informed consent.

Results

There were a total of 74 patients, out of which 49 were male and 25 were female. The percentage of males was 66, and females were 34. Age wise distributions of patients are given in the Table 1.

Table 1: Age wise distribution of patients with the percentage.

Age	*Total no. of patients (n=72)*	*Percentage (%)*
19-29	2	2.7
29-39	12	16.21
39-49	13	17.56
49-59	21	28.37
59-69	11	14.86
69-79	12	16.21
79-89	3	4.05
89-99	0	0%

In our study we categorized the patient's body weight from 35-95 (Table 2). Use of furosemide in the patients was classified and there were already on furosemide 12% and newly prescribed 88% (Table 3).

Table 2: Patients distribution based on their gender with the body weight groups.

Body weight in Kgs	*Female*	*Male*	*Total*
35-45	1	0	1
45-55	15	7	22
55-65	9	11	20
65-75	0	21	21
75-85	0	10	10
85-95	0	0	0

Table 3: Use of furosemide in the patients was classified.

Usage status	*No. of patients*
Already on furosemide	9
Newly prescribed	65

The review 1 was based on the results after the one month usage of furosemide in patients, which are given in the Table 4.

Table 4: The results after one month usage of furosemide in patients.

Age	*Average urine output*	*Average sodium level*
19-29	2.4L/day	132.1mEq/L
29-39	2.38L/day	135.2mEq/L
39-49	2.76L/day	132.1mEq/L
49-59	2.29L/day	139.5mEq/L
59-69	1.7L/day	127.2mEq/L
69-79	1.59L/day	125.2mEq/L
79-89	1.2L/day	128.1mEq/L

Results were obtained/calculated by using the arithmetic Mean: AM= sum of urine output in an age group/Total no. of patients in an age group AM= sum of sodium levels in an age group/Total no of patients in age group**.** Review 2 results were based on three months of drug usage and noted in the Table 5.

Table 5: The results after three months usage of furosemide in patients.

Age	*Average urine output*	*Average sodium level*
19-29	2L/day	138.2mEq/L
29-39	2.1L/day	136.2mEq/L
39-49	2.2L/day	134.8mEq/L
49-59	1.97L/day	129.7mEq/L
59-69	1.65L/day	133.7mEq/L
69-79	1.28L/day	131.2mEq/L
79-89	1.1L/day	126.5mEq/L

Out of 74 patients, 6 patients showed the possible and significant adverse effects and 68 ADR negative patients. The possible adverse effects were classified, i.e., stomach pain-4, ototoxixity-2, inflead kidney-0, tinnitus-1, skin irritation-2 and others-5. The reason of ADR's observed for discontinuation of drugs was four patients. ADR positive patients were 8% and ADR negative patients were 92%.

Discussion

The use of furosemide in the treatment of heart diseases showed signified and positive results with some potential adverse effects in some patients [13].

Total 74 subjects were included in our study, between the age group of 19- 89 years. Out of which 49 are male and 25 are females. The majority of the patients are in between the age group of 49-59 with the percentage of 28.37%. Most of the patients (68) had no complaints when they were on furosemide usage. However, 6 of the patients showed some side effects like ototoxicity (hearing loss), stomach pain, skin irritation, inflamed kidneys and some other potential effects.

The drug's usage after one month of administration is the basis for Review 1's outcome. It produces a considerable amount of urine excretion (Diuresis) after one week of treatment. The age group of 39-49 showed the higher amount of urine excretion with normal amount of sodium. The age group of 79-89 causes low level of urine excretion due to lack of thirst. Based on 3-month drug delivery period, Review-2 data indicates that the 39–49 age group excretes more urine.

Conclusion

Furosemide usage in the heart diseases showed positive results and also evaluates the increase in the urine output and the balance in sodium levels. The chances of adverse effects are low and potential affects like ototoxicity, electrolyte imbalance, stomach pain, ringing in the years, nausea and vomiting's. Multicentric with large sample size required in future studies.

Conflicts of interest

Authors declare no conflicts of interest.

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