Early usage of Digoxin in bronchopneumonia decrease the need for hospitalization

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Abstract

The early usage of digoxin has more beneficial effects when given early in the treatment of bronchopneumonia complicated by congestive heart failure.

Among 400 patients (children 2-5 years old) treated with digoxin , when the early signs and symptoms of congestive heart failure were detected, in addition to Paracetamol ,Ventoline and Erythromycin, 72.5% of patients had good response in the second day of treatment , where as 19% of them have shown good response in the third day, 5% in the fifth day and the others have needed hospitalization (3.5%).

So the early usage of digoxin, in patients with bron- chopneumonia complicated by congestive heart failure, decrease the need for hospitalization.

الاستخدام المبكر للديجوكسين في ذات الرئة القصبي يقلل الحاجة الى دخول المستشفى

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الخلاصة

ان الاستخدام المبكر لعلاج الديجوكسين له تأثيرات نافعة عندما يعطى مبكرا في علاج مرض ذات الرئة القصبي المصحوب بعجز القلب الاحتقاني .

من بين (400) مريض (وهم أطفال تتراوح أعمارهم 2-5 سنوات) عولجوا بالدايجوكسين digoxin , عند وجود بداية لاعراض عجز القلب الاحتقاني اضافة الى ذات الرئة القصبي , إضافة إلى الباراسيتول والفنتولين والارثرومايسين فأن (72.5 %) منهم اعطوا استجابة جيدة في اليوم الثاني من العلاج في حين (19%) منهم في اليوم الثالث و(5%) في اليوم الخامس . اما الباقون (3.5%) فأنهم احتاجوا إلى دخول المستشفى . لذلك فأن الاستخدام المبكر لهذا العقار في مرضى ذات الرئة القصبي المصحوب بعجز القلب الاحتقاني يقلل من الاحتياج إلى دخول المستشفى .

Introduction

Digoxin is the drug of choice in the treatment of the heart failure [1], [2], [3]. Digoxin should be used as first – line therapy in patients with heart failure and atrial fibrillation , when it usually provides ade- quate control of the ventricular rate (decrease heart rate) together with a small positive inotropic effect. Treatment with digoxin had no effect on overall survival but did reduce the need for hospitalization [4]. Cong- estive failure caused by a variety of underlying mechanism resp- onds well to Digitalis treatment, by increasing contractility, the drug increases cardiac output and relieves the elevated ventricular pressures, pulmonary congestion and venous pressure. Diuresis is brought about with relief of edema [5].

In bronchopneumonia the infection involves all the lung elements in the affected zone, including the bronchi, blood vessels, lymphatic's, and lung parenchyma. The onset is sudden, marked by fever that becomes irregular, gastrointestinal diso- rders, diarrhea and vomiting, and signs of shock with a pale clammy skin, peripheral cyanosis and signs of peripheral circulatory failure, a rapid weak pulse, cold extremities, low blood pressure and oliguria. The level of consciousness is often affected. The respiratory synd- rome has the same severity, with rapid breathing [6]. Although bacterial infections (Strepto- cocci, Staphylococci or H. Influenza) of the lung often appear to be a primary event and result from contamination of the lung via the air passages or the blood, frequently they are also found to be the complication of an unsuspected respiratory infection. Examples of this type are numerous secondary infection of a viral pneumonitis or Whooping [6]. In younger children, viral infections predominate[4]. Bronchopneumonia , especially in the late stages , heart failure may be happened [7], [8] .The cause of this heart failure may be due to the hypoxia resulted from edema of the lung and decrease O_2 exchange . The lung edema and consolidation interfere with the free movement of blood in the lung in spite of the vasodilatation due to infla- mation. This lead to put another load on the heart which may induce failure (weak pulse) [9]. In the treatment of pneumonia we used to use digoxin only when heart failure happened, it mean in the late stage [10], [11].

Bronchopneumonia, bronc- hitis or bronchiolitis by the development and spread from, more common in infants and children accounted for 42.5% of the total number of pediatric hospital to 56.3%, death in children cause of death in infants with pneumonia accounted for the first caused. Therefore, in children with pneumonia and heart failure to enhance the early observation and care is very important [12]. So in our study here , we tried to use digoxin early in the treatment of pneumonia (just with the beginning of the signs and symptoms of heart failure) and the result was compared with the control samples in which digoxin did not added or given .

Patients and Methods

This study was done in our private clinic in Kerbala city during the last five years (2005 – 2010).

Samples :- 600 patients (children 2-5 years old), complaining from bronchopn- eumonia complicated by heart failure, were divided into two groups . 1st group 200 patients & 2nd group 400 patients .

1ˢᵗ group :- (control group). The patients here were treated for bronchopneumonia by antipyretic (Paracetamol as suspension), bronchodilators (Salbutamol 0.3 mg/kg/day on need) and (Erythromycin antibiotics 20 mg/kg/day). Erythromycin was chosen because it has a role in the treatment of Streptococcal, Pneumococcal and Staphyl- lococcal infections when because of allergy patients can not be given Pencillin, also the drug recommended in Mycoplasma pneumonia and in Pertosis[13].

2ⁿᵈ group:-

In addition to the above treatment in group one, digoxin drops (3 microgram/kg body weight/day)was given here.

In this group we told the children parents that their children have bronchopneumonia complicated by heart failure and we are going to give them anti – failure treatment and they agreed.

All the cases were diagnosed (as bronchopne- umonia) according to the signs and symptoms and chest X-RAY, but the diagnosis of heart failure was done according to the following (Suffering children shortness of breath, 60 times/min or more, the pulse 160 times/min or more, pale, cold body, neck vein engorgement, increased heart circles, eyelid edema, consist with the diagnosis of heart failure) [12].

Daily clinical examination was done to all the patients to evaluate the responses, taking in consideration the pulse rate in digoxin treated patients to detect early signs of digoxin toxicity as vomiting or decreased pulse rate < 100 times/min [12].

Regarding body tempe- rature, it was estimated by rectal examination, daily examination was done in the follow up. It seems to be helpful as a parameter in the evaluation of the infection.

Pulse rate, after the removal of high temperature effect (Arise of body temp- erature by $1C^{°}$ is associated with an increase in pulse rate of eight beats/min (Lieber meisters rule).) [14], was our parameter to evaluate heart failure only.

Respiratory rate is usually affected by heart failure and fever, so it was our parameter to evaluate both the state of the heart and the infection.

The decreased severity of the other signs as shortness of breath, cyanosis, bad consci- ousness and edema was our parameter , in which it was titled (general condition), to evaluate the state of both the heart and the bronchopneumonia.

Complete cure was diagnosed when good general condition (1), body temperature 37 C° (2), (for healthy children a resting heart rate of 90 bpm (3) and a respiratory rate of 19 breath per minute (4) are within the normal range for all ages between 4 and 16 years)[15].

Microbiological tests such as culturing or antibiotics sens- itivity

where also done in some patients when needed.

Spss program was used in the statistical evaluations of the results.

Results The results were shown as follow:-

1st group:- (control ``200 patients``). Table (1).

According to the mentio- ned four parameters before (pulse rate, respiratory rate, body temperature and general con- dition of the patients) the results were:-

- Comparing with the state of the patients in the first day (pulse rate above 160 beats /minute, respiratory rate above 60 breaths / minute, temperature 39 ± 1 C° and bad general condition), 10 patients (5%) were improved (pulse rate less than 160 and above 100 beats / minute, respiratory rate less than 60 and above 19 breath / minute, temperature 38 ± 1 C° and good general condition) in the second day of treatment.
- 24 patients (12%) were included in this improvement in the 3rd day of treatment.
- 22 patients (11%) were included in this improvement in the 5th day of treatment.
- The remainder 144 patients (72%) were hospitalized after deterioration.
- So in the control group, no significant daily improved number of patients, but at the end of the week, the total improved number of patients (56) (28%) was significant (p< 0.01), also the number of the hospitalized patients (144) (72%) was significant (p < 0.01).
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Table (1):- The results in 1st group

Time of Treatment	Number of patients		Patients condition
1st day	200 patients		PR>160 bpm RR> 60 Bpm Temp 39 ± 1C° Bad general condition
2nd day	No. of patients	Percentage	
	10	5 %	100 < PR < 160 19 < RR < 60 Temp 38 ± 1C° Good general condition
3rd day	24	12 %	
5th day	22	11 %	
One week	Total No. of improved patients 56 *	Percentage 28 %	PR = 120 ± 10 RR = 25 ± 5 Temp 37 C° Good general condition
	Total No. of hospitalized patients 144 *	Percentage 72 %	PR > 160 RR > 60 Temp 39 ± 1 C° Bad general condition

* P < 0.01   PR = pulse rate
           RR = Respiratory rate

2nd group :- (Digoxin group 400 patients). Table (2).

According to the ment -ioned four parameters in the first group :-
- 290 patients (72.5%) were improved in the second day of treatment .
- 76 patients (19%) were improved in the third day of treatment.
- 20 patients (5%) were improved in the fifth day of treatment.
- The remainder 14 patients (3.5 %) were hospital- ization after deterioration.

So in digoxin treated group (table 2), a significant daily improvement was detected in the 2nd day (290) patients (p< 0.01) and in the 3rd day (76 patients (p < 0.05) and the total number of improved patients in the end of treatment (386) patients (96.5%) which was highly significant (p < 0.01).

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Table (2) :- The results in 2nd group

Treatment	Number of patients		Patients condition
1st day	400 patients		PR>160 bpm RR> 60 Bpm Temp 39 ± 1C° Bad general condition
2nd day	No. of patients	Percentage	
	290 *	72.5 %	100 < PR < 160 19 < RR < 60 Temp 38 ± 1C° Good general condition
3rd day	76 **	19 %	
5th day	20	5 %	
One week	Total No. of improved patients 386 *	Percentage 96.5 %	PR = 120 ± 10 RR = 25 ± 5 Temp 37 C° Good general condition
	Total No. of hospitalized patients 14	Percentage 3.5 %	PR > 160 RR > 60 Temp 39 ± 1 C° Bad general condition

*   P < 0.01   PR = pulse rate
** P < 0.05   RR = Respiratory rate

When comparing between the tow groups (between table 1 and table 2) see (table 3), a significant difference between the daily responses in both groups were detected. In the 2nd and 3rd days of treatment, the good responses (number of improved patients) in the digoxin group were significantly (p < 0.01) higher than the good response in the control group. In the 5th day of treatment the good response in the control group was significantly (p < 0.01) higher than the good response in the digoxin group. The total good response in the digoxin group at the end of one week treatment was significantly (p < 0.01) higher than the total good response in the control group, while the bad response (number of hospitalized patients) in the control group was significantly (p < 0.01) higher than the bad response in the

digoxin group after one week treatment.

Table (3) :- The results in 1st and 2nd groups

Treatment	Number of patients				Patients condition
	1ST group		2nd group		PR>160 bpm RR> 60 Bpm Temp 39 ± 1C° Bad general condition
1st day	200 patients		400 patients		
2nd day	NP	Pe	NP	Pe	
	10	5 %	290*	72.5%	100 < PR < 160 19 < RR < 60 Temp 38 ± 1C° Good general condition
3rd day	24	12 %	76*	19 %	
5th day	22*	11 %	20	5 %	
One week	TINP	Pe	TINP	Pe	PR = 120 ± 10 RR = 25 ± 5 Temp 37 C° Good general condition
	56	28%	386*	96.5%	
	THP	Pe	THP	Pe	PR > 160 RR > 60 Temp 39 ± 1 C° Bad general condition
	144*	72%	14	3.5%	

*   P < 0.01

Pe   Percentage
NP   number of patients
TINP   total improved number of patients
THP   total hospitalized patients
PR   pulse rate
RR   Respiratory rate

The remainder 14 patients in Dixoxin group were tested microbiologically to isolate the causative agent from the sputum of them , The results were as follow :
- 7 patients had no pathogens isolated .
- 5 **pneumococcus**
- 2 **Staphyllococcus aureus**

The isolates <u>pneumococcus</u> and **<u>S. aureus</u>** were tested for Antibiotics by Kirby & Paur methods [16] using Ampicilline , Optochine ,Cephalothine ,Linc- ocine and Cloxaciline discs. The results were that:- all the isolates were resistant to Ampicilline and sensitive

to Cephalothine and Lincocine, So we advised to use these antibiotics instead of Erythromycin which was used in our study .

Discussion :-

Because of the similarity in the signs and symptoms between bronchopneumonia and heart failure, we used to diagnose bronchopneumonia as bronch-opneumonia alone without pays attention to the underlying heart failure which is usually present because of the overload, but in our study The dramatic response of the patients shown in the first 3 days of the treatment indicating that the early usage of digoxin had more beneficial effects when was given early in the treatment of pneumonia.

The effect may be resulted from the improvement of heart work[17], [18] by digoxin which lead to decrease the pulmonary edema[3] and this in turn caused more freedom to the movement of the lung and more freedom to the flow of the blood .All these factors may be the causes of early improvement in the condition of the patients [19].

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