

Effect of Metoprolol on cardiac function and hypertensive left ventricular hypertrophy

Sun Lin (SUN L) (Henan Provincial People's Hospital, Zhengzhou 450003)

ABSTRACT **OBJECTIVE:** To study the effect of Metoprolol on cardiac function and hypertensive left ventricular hypertrophy. **METHOD:** Sixty-one patients with hypertensive left ventricular hypertrophy were randomly divided into 2 groups, 31 in treatment group and 30 in control group. The patients in treatment group were given 25 ~ 50 mg Metoprolol once or twice a day and the patients in control group were given 1 piece compound hypotensive once for three times a day, which should be used for 12 to 16 weeks with average of 13.2 weeks until blood pressure was controlled at or near critical level. Under color Doppler flow image, ventricular hypertrophy and cardiac function were compared before and after treatment with statistic method. **RESULTS:** It showed that HR, SBP, DBP and TPR were dropped down with total effective rate of 87 % ($P < 0.01$). Left ventricular morphosis criterion as LAD, LVD and LVMI were all obviously improved ($P < 0.05 \sim 0.01$). Left ventricular diastolic function criterion as A/E, A/E, PER and NPFR were also improved ($P < 0.05$). No changes occurred in left ventricular systolic criterion as SV, EF and CO ($P < 0.05$). **CONCLUSIONS:** Metoprolol can treat hypertension as well as improve cardiac diastolic function and left ventricular hypertrophy. **KEY WORDS** Metoprolol, hypertension, hypertrophy, heart function

倍他乐克对高血压患者左心室肥厚及心功能的影响

孙琳(郑州 450003 河南省人民医院)

摘要 **目的:** 观察倍他乐克降压及改善左心室肥厚的作用。**方法:** 61 例高血压左室肥厚的患者, 随机分为治疗组 31 例, 给予倍他乐克片 25 ~ 50 mg, 每日 1 ~ 2 次, 对照组 30 例, 复方降压片 1 片, 每日三次。血压控制在正常或接近正常水平后, 继续服药 12 ~ 16 周, 平均 13.2 周。采用多普勒血流显像, 用统计学处理方法, 对照用药前后血压、心率、心室肥厚、心脏收缩及舒张功能。**结果:** 两组经治疗后血压显著下降 ($P < 0.01$), 治疗组心率及外周阻力显著下降 ($P < 0.05 \sim 0.01$), 心房内径变小 ($P < 0.01$), 左室重量指数降低 ($P < 0.01$)。左室舒张功能指标: A 峰降低, E 峰增高, A/E 比例降低, 峰值充盈率及标准化峰值充盈率均升高 ($P < 0.01$)。**结论:** 倍他乐克在显著降压的同时, 还可使肥厚的心肌发生逆转, 明显改善心脏舒张功能。**关键词** 倍他乐克; 高血压; 左室肥厚; 心功能

Materials and Methods

1. Materials

61 patients with hypertensive left ventricular hypertrophy were from in- or out-patient department of our hospital since July, 1996 to July, 1999. Of these 61 cases, 49 were male and 12 female, aged from 60 to 85 years with average of 74 ± 6 years. The course of disease was from 4 years to 30 years with average of 13.6 years. All these 61 cases were divided into 2 groups, in which 31 cases in the treatment group were treated with Metoprolol and the other 30 cases in control group were treated with compound hypotensive. The age, sex, disease course and condition had no obvious difference between two groups.

2. Methods

One week after stopping administration and other

medicine, 25 ~ 50 mg of Metoprolol was given once or twice a day. In control group, 1 piece of compound hypotensive was given three times a day. After blood pressure got normal or after the patient was discharged, blood pressure should be controlled at critical level or near it with outpatient administration for 12 to 16 months (average of 13.2 weeks). Blood, urine, stool, blood sugar, glucose in urine, blood lipid, ECG and X-ray were routinely examined, meanwhile clinical symptoms, physical signs and adverse reaction were observed.

3. Evaluation criterion under color Doppler

Aloka-870 color Doppler flow imaging with bougie frequency of 3.0 MHz was used. With the patient on left lateral position, LVD, LAD, IVST and PWT were detected by M and 2-dimensional echocardiography with Penn method^[1], LVD was

calculated with Devereux formula , LVMI was correctively counted on basis of BSA .

Diagnostic criterion of left ventricular hypertrophy^[2]: (1) IVST ≥ 12 mm , (2) PWT ≥ 12 mm , (3) LVMI ≥ 132 g/ m²(for male) , LVMI 108g/ m² (for female) . SV, EF and CO were calculated with Teichholz formula . TPR was calculated on basis of CO and MAP with PDE lead by 2DE , left ventricular diastolic function criterion were measured as Peak A, Peak E , A/ E , PFR and NPFR .

T test was used to determined the differences between before and after treatment .

Results

Changes of criterion between before and after treatment with Metoprolol , (see Table) .

The table showed obvious lower of blood pressure in two groups ($P < 0.01$) and no obvious change of other parameters in control group ($P < 0.05$) after treatment . In the treatment group , HR was reduced . SBP , DBP and TPR were greatly decreased ($P < 0.05 \sim 0.01$) , which indicated circulatory arterial blood pressure was dropped down and cardiac afterload was re-

duced . The effective rate was 61 % (19/31) . The effective rate was 26 % (8/ 31) , 13 % had no effect (4/ 31) . The total effective rate 87 % (27/ 31) . LVD and LAD were shortened ($P < 0.01$) . LVMI as decreased ($P < 0.01$) which indicated that left atrioventricular cavity ectatic process was reversed and left ventricular hypertrophy was improved . Left ventricular systolic function criterion as SV, EF and CO were raised a little but it had no statistic significance ($P > 0.05$) . Therefore it was indicated that Metoprolol could not increase cardiac output and ejection fraction . Peak A was dropped , peak E was raised . A/ E ratio was decreased . PFR was increased and NPFR was increased ($P < 0.01$) , which indicated left ventricular diastolic unfilling volume was increased and diastolic function was obviously improved after treatment . All the biochemical parameters had no obvious difference .

After treatment with Metoprolol , dizzy occurred in 5 cases (16.15 %) , headache in 2 cases (6.5 %) , hypodynamic in 7 cases (22.5 %) and nausea in 6 cases (19.3 %) . All the side-effects occurred in 1 to 3 days and disppeared in 5 to 7 days , which did not affect continous administration .

Table Changes of criterion between before and after treat ment ($\bar{x} \pm s$)

Para meters	treat ment group		control group	
	before treat ment	after treatment	before treat ment	after treatment
HR (min ¹)	78 .6 \pm 5 .8	64 .8 \pm 8 .6 ^{**}	76 .8 \pm 5 .7	72 .5 \pm 8 .4
SBP (kPa)	23 .8 \pm 4 .2	17 .8 \pm 2 .4 ^{**}	23 .8 \pm 3 .8	17 .9 \pm 2 .3 ^{**}
DBP (kPa)	14 .6 \pm 1 .8	11 .9 \pm 2 .6 [*]	14 .5 \pm 1 .7	11 .5 \pm 2 .3 [*]
TPR (dyn .s .cm ⁻⁵)	2098 \pm 628	1622 \pm 42 ^{**}	2096 \pm 625	1630 \pm 421 ^{**}
LAD (cm)	3 .76 \pm 0 .49	3 .42 \pm 0 .43 [*]	3 .73 \pm 0 .48	3 .70 \pm 0 .45
LVD (cm)	5 .62 \pm 0 .45	4 .56 \pm 0 .38 ^{**}	5 .43 \pm 0 .44	5 .41 \pm 0 .37
LVMI (g/ m ²)	166 \pm 42	128 \pm 26 ^{**}	167 \pm 38	161 \pm 28
SV (ml)	89 .8 \pm 11 .4	90 .6 \pm 12 .5	87 .4 \pm 10 .3	90 .3 \pm 12 .3
EF(%)	45 .8 \pm 6 .2	46 .5 \pm 6 .6	46 .0 \pm 5 .9	47 .3 \pm 6 .4
CO (L/ min)	5 .72 \pm 1 .26	5 .86 \pm 1 .32	5 .70 \pm 1 .31	5 .81 \pm 1 .08
A(cm/ s)	76 .5 \pm 11 .8	55 .6 \pm 12 .6 ^{**}	75 .6 \pm 11 .3	64 .9 \pm 12 .2
E(cm/ s)	62 .6 \pm 12 .4	79 .8 \pm 13 .8 ^{**}	63 .1 \pm 12 .2	59 .1 \pm 13 .8
A/ E	1 .32 \pm 0 .28	0 .68 \pm 0 .14 ^{**}	1 .30 \pm 0 .28	1 .24 \pm 0 .16
PFR (ml/ s)	152 .8 \pm 44 .6	156 .4 \pm 77 .8 ^{**}	151 .8 \pm 40 .6	168 .8 \pm 76 .4
NPFR (ml/ s)	1 .68 \pm 0 .26	2 .18 \pm 0 .51 ^{**}	168 \pm 0 .30	174 \pm 0 .55

* : $P < 0.05$; ** : $P < 0.01$

Discussions

Left ventricular hypertrophy is a cardiovascular risk factor depending upon blood vessels but not a benign , physiological and adaptive compensatory process . As sympathetic nerve activity and catecholamine were all increased when hemodynamics was stimulated^[3] . Being a selective β blocker , Metoprolol could inhabit excited sympathetic nerve , reduce the release of catecholamine and stimulate RAAS activity^[4] , 3 months after treatment Motoprolol , LVMI was decreased , left ventricular hypertrophy rate fell down from 60 % to 8 % , and left atrioventricular cavity ectatic process was reversed meanwhile the diastolic func-

tion was improved which was showed by drop at peak A , raise at peak E , increase of PFR and NPFR and no difference in diastolic function criterion as SV, EF and CO .

It suggests that treatment with Metoprolol for long time may reverse myocardial hypertrophy and improve diastolic function . Compound hypotensive could only drop down blood pressure but not reverse myocardial hypertrophy . Therefore , the author recommended β blocker as the first choice medicine for the patients with hypertension and coronary heart disease combined with left ventricular hypertrophy as soon as they were diagnosed with left ventricular diastolic insufficiency no matter whether

heart was dilatated. Dosage and therapeutic course should be controlled in the treatment.

References

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收稿日期: 2000-12-13