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住院精神病患者大肠埃希菌感染分布状况、耐药性及其危险因素分析*

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摘要 目的:了解住院精神病患者大肠埃希菌的感染分布情况及对常用抗菌药物的耐药状况,并分析感染大肠埃希菌的危险因素。**方法:**回顾性收集 2016 年 1 月-2019 年 1 月间 1100 例接受住院治疗的临床资料,收集其临床标本并分离大肠埃希菌,采用法国生物梅里埃公司的 VITEK-32 系统进行菌种鉴定及药敏试验,采用 K-B 琼脂扩散法检测细菌的耐药性。单因素和多因素 logistic 回归分析大肠埃希菌感染的危险因素。**结果:**1100 例精神病患者中共有 51 例患者检出了大肠埃希菌感染,感染率为 4.64%(51/1100),共分离出 87 株大肠埃希菌。各类标本来源分布占比从高到低依次是尿液 42.53%(37/87)、痰及呼吸道分泌物 36.63%(31/87),粪便 14.94%(13/87),伤口引流液 4.60%(4/87),血液 2.30%(2/87);科室分布占比从高到低依次是老年科 66.67%(58/87),精神科 25.29%(22/87),心理科 8.05%(7/87)。大肠埃希菌主要对氨苄西林、四环素、环丙沙星、头孢唑啉耐药,耐药率分别为 93.25%、80.03%、77.30%、72.51%,对亚胺培南不耐药,耐药率为 0.00%。单因素分析结果显示年龄、长期使用抗精神药物、住院时间、侵入性操作和频繁使用抗菌药物治疗均与住院精神病患者大肠埃希菌感染相关($P<0.05$)。多因素 logistic 回归分析结果显示年龄 ≥ 55 岁、住院时间 ≥ 45 d、侵入性操作、长期使用抗精神药物和频繁使用抗菌药物治疗是住院精神病患者大肠埃希菌感染的危险因素($P<0.05$)。**结论:**大肠埃希菌耐药性日趋严重,临床抗感染治疗上,应根据药敏试验结果、结合实际情况合理选用抗菌药物,有效减少耐药菌株的扩散,降低大肠埃希菌感染。此外,年龄 ≥ 55 岁、长期使用抗精神药物和频繁使用抗菌药物治疗、侵入性操作、住院时间 ≥ 45 d 均是大肠埃希菌感染的危险因素,值得重点关注。

关键词:大肠埃希菌;感染;精神病;抗菌药物;耐药性;危险因素

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The Distribution and Drug Resistance and Risk Factors of *Escherichia Coli* Infection in Psychiatric Inpatients*

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ABSTRACT Objective: To understand the distribution of *Escherichia coli* infection and the resistance to common antibiotics in psychiatric inpatients, analysis of risk factors of infection with *Escherichia coli*. **Methods:** The clinical data of 1100 inpatients between January 2016 and January 2019 were collected retrospectively, clinical specimens and isolation of *Escherichia coli* were collected. Using VITEK-32 system in French bioMérieux's company to conduct strain identification and susceptibility testing and the method of KB agar diffusion to detect bacterial resistance. Single factor and multiple factor Logistic regression were used to analysis of risk factors of *Escherichia coli* infection. **Results:** There were 51 case *Escherichia coli* infection was detected in 1100 psychiatric patients, the infection rate was 4.64%(51/1100) and 87 strains of *Escherichia coli* were isolated. From the highest to the lowest, the distribution of all kinds of specimens was 42.53% (37/87) in urine, 36.63% (31/87) in sputum and respiratory secretion, 14.94% (13/87) in feces, 4.60% (4/87) in wound drainage fluid, 2.30% (2/87) in blood, 66.67% (58/87) in geriatrics, 25.29% (22/87) in psychiatry, 8.05% (7/87) in psychology. The resistance rate of *Escherichia coli* to ampicillin, tetracycline, ciprofloxacin and cefazolin were 93.25%, 80.03%, 77.30% and 72.51% respectively, and the resistance rate to imipenem was 0.00%. Univariate analysis showed that age, long-term use of antipsychotics, length of stay, invasive operation and frequent use of antibiotics were all related to *E.coli* infection in psychiatric inpatients($P<0.05$). Multivariate logistic regression analysis showed that Age greater than or equal to 55 years old, hospital stay time greater than or equal to 45 d, invasive operation, long-term use of antipsychotics and frequent use of antibiotics are the risk factors of *E.coli* infection in hospitalized psychiatric patients($P<0.05$). **Conclusions:** The drug resistance of *Escherichia coli* is becoming more and more serious. In the clinical

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anti infection treatment, we should select antibiotics reasonably according to the results of drug sensitivity test and the actual situation, so as to effectively reduce the spread of drug-resistant strains and reduce the infection of *Escherichia coli*. In addition, age greater than or equal to 55 years old, long-term use of antipsychotics and frequent use of antibiotics, invasive operation, hospital stay time greater than or equal to 45d are all risk factors of *E.coli* infection, which is worthy of special attention.

Key words: *Escherichia coli*; Infection; Psychosis; Antibacterial drugs; Drug resistance; Risk factor

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前言

大肠埃希菌是革兰氏阴性短杆菌,是人和动物肠道中的正常栖居菌,当机体长期使用抗菌药物或抵抗力下降时,能引起多部位发生感染,是医院获得性感染的常见致病菌^[1-3]。近年来,由于抗菌药物的频繁使用导致其出现耐药菌株,且耐药性越来越强,耐药谱越来越广的趋势^[4,5],其处理难度逐年增加。精神病患者由于受各种精神症状如情绪不稳定、反应迟钝的影响,常造成生活自理能力差、进食无规律、夜间睡眠差等,致使免疫力下降,同时病人伴有的认知障碍导致患者治疗依从性差,进而导致患者细菌感染的机会增加^[6-8]。目前住院患者致病菌感染的报道较为常见,但鉴于病耐药性逐年变化,且有关精神病人大肠埃希菌感染的危险因素的相关报道尚不多见,为了解这部分特殊人群中大肠埃希菌的感染临床分布及耐药情况及感染的危险因素,本研究统计了了精神病患者中分离的大肠埃希菌分布情况,并分析大肠埃希菌感染的危险因素,以期减少大肠埃希菌感染以及合理用药提供一定参考。

1 资料与方法

1.1 一般资料的收集及菌株来源

回顾性收集 2016 年 1 月 -2019 年 1 月间 1100 例接受住院治疗的精神病患者的临床资料,包括年龄、性别、住院时间等

资料。收集其临床标本并分离大肠埃希菌,其中标本包括痰液、尿液、血液、粪便、伤口引流液。所有菌株均用法国生物梅里埃公司 VITEK-32 系统进行鉴定。

1.2 药敏试验

采用美国临床和实验室标准化研究所 (CLSI) 推荐的 Kirby-Bauer (K-B) 纸片扩散法,结果按 CLSI 2010 年版标准进行判断^[9]。试验抗菌药敏纸片采用英国 Oxoid 公司产品,MH 琼脂 (Mueller. Hinton Agar) 培养基购于杭州天和生物试剂有限公司。质控菌株为大肠埃希菌 ATCC25922。

1.3 统计学方法

采用 SPSS23.0 统计学软件进行统计分析,用百分率及占比分析菌株分布情况和耐药率的统计分析,采用单因素和多因素 logistic 回归分析大肠埃希菌感染的危险因素, $P<0.05$ 时判定为差异有统计学意义。

2 结果

2.1 大肠埃希菌临床感染率及分布情况

1100 例精神病患者中共有 51 例患者检出大肠埃希菌感染,感染率为 4.64%(51/1100),共分离出 87 株大肠埃希菌。各类标本来源分布占比从高到低依次是尿液、痰及呼吸道分泌物、粪便、伤口引流液、血液,见表 1;各科室分布以老年科为主,其次为精神科、心理科,见表 2。

表 1 大肠埃希菌临床感染的标本来源分布情况

Table 1 Distribution of specimen sources of clinical infection of *Escherichia coli*

Specimen source distribution	Quantity (plants)	Proportion(%)
Urine	37	42.53
Sputum and respiratory secretions	31	36.63
Faeces	13	14.94
Wound drainage fluid	4	4.60
Blood	2	2.30
Total	87	100.00

表 2 大肠埃希菌临床感染的科室分布情况

Table 2 Distribution of departments of clinical infection of *Escherichia coli*

Department Distribution of specimen source	Quantity (plants)	Proportion(%)
Geriatrics department	58	66.67
Psychiatry department	22	25.29
Psychology department	7	8.05
Total	87	100.00

2.2 大肠埃希菌耐药情况

对大肠埃希菌最敏感的抗菌药物是亚胺培南,未发现耐

药株;氨苄西林、四环素、环丙沙星、头孢唑啉的耐药率位居前列,耐药率分别为 93.25%、80.03%、77.30%、72.51%。详见表 3。

表 3 87 株大肠埃希菌对常用抗菌药物的耐药情况

Table 3 Resistance of 87 strains of *Escherichia coli* to common antibacterial drugs

Antibacterial drugs	Sensitivity rate(%)	Intermediary rate(%)	Drug resistance rate(%)
Ampicillin	2.03	4.72	93.25
Piperacillin / tazobactam	45.61	40.23	14.16
Amoxicillin	19.38	19.60	61.02
Ceftazidime	72.10	12.15	15.75
Cefazolin	16.43	11.06	72.51
Cefotaxime	30.51	4.25	65.24
Cefepime	60.15	5.62	34.23
Ceftriaxone	39.17	10.23	50.60
Cefoperazone / Sulbactam	58.65	5.03	36.32
Aztreonam	43.76	21.11	35.13
Levofloxacin	32.70	2.05	65.25
Ciprofloxacin	16.51	6.19	77.30
Amikacin	86.73	2.65	10.62
Compound Xinnuoming	31.25	0.90	67.85
Gentamicin	41.21	0.34	58.45
Tetracycline	19.97	0.00	80.03
Tobramycin	41.21	5.07	53.72
Imipenem	99.37	0.63	0.00

2.3 住院精神病患者大肠埃希菌感染单因素分析

住院精神病患者大肠埃希菌感染与年龄、长期使用抗精神药物情况、住院时间、侵入性操作和频繁使用抗菌药物治疗相关($P<0.05$),而与性别、季节、精神病类型、合并其他疾病无关($P>0.05$)。见表 4。

2.4 住院精神病患者大肠埃希菌感染多因素 Logistic 回归分析

以住院精神病患者是否感染大肠埃希菌作为因变量,表 3 中有统计学意义的因素为自变量进行多因素 Logistic 回归分析,结果显示年龄 ≥ 55 岁、住院时间 ≥ 45 d、侵入性操作、长期使用抗精神病药物和频繁使用抗菌药物治疗是住院精神病患者大肠埃希菌感染的危险因素($P<0.05$)。见表 5。

3 讨论

大肠埃希菌是寄居在人和动物肠道中的正常菌群,能发酵多种糖类产酸、产气,当机体免疫功能下降时,能够引起多部位发生感染,是革兰氏阴性杆菌中分离率较高的一种条件致病菌^[9-11]。精神病患者由于受各种精神症状的影响,生活自理能力下降,出现进食无规律、乱食异物、喝生水、进不洁食物、夜间睡眠差,引起机体免疫功能的下降,免疫力一旦下降,患者感染病菌的风险上升^[12,13]。了解住院精神病患者的大肠埃希菌感染分布及耐药情况,对临床合理使用抗菌药物以及维护人体健康具有重要意义。

大肠埃希菌广泛存在于多种临床标本中,本次研究结果显示,痰液、尿液、血液、粪便、伤口引流液等临床标本均检出大肠埃希菌,其中以尿液(42.53%)和痰及呼吸道分泌物(36.63%)居多,与既往研究中大肠埃希菌检出标本分布情况基本吻合^[14,15];在各科室分布情况是以老年科(66.67%)为主,表明大肠埃希菌在老年人群中较易感染,由于老年精神病患者组织器官发生退行性改变,病种多样化,机体免疫力明显下降,同时长期联用多种抗生素及精神科药物,致使正常菌群失调,导致感染的发生率增高^[16-18]。提示应加强老年患者这一人群的关注,做好卫生宣教工作,指导并训练患者养成良好的卫生习惯,加强营养,合理膳食,组织患者多进行室外锻炼活动,以提高患者的机体免疫力。

随着抗菌药物在临床上的广泛使用,多重耐药或耐药致病菌的出现给临床治疗带来了很大困难,大肠埃希菌已成为医院感染的重要病原菌^[19,20]。本次研究结果表明,分离的大肠埃希菌的耐药性较为严重,氨苄西林、四环素、环丙沙星、头孢唑啉的耐药率位居前列,耐药率分别为 93.25%、80.03%、77.30%、72.51%,其临床治疗效果较弱。而亚胺培南是对大肠埃希菌最敏感的抗菌药物,另外大肠埃希菌对阿米卡星、哌拉西林/他唑巴坦、头孢他啶药物也较敏感,表明这一类抗菌药物可作为治疗大肠埃希菌感染的首选考虑药物,其具有较好的治疗效果。

进一步 logistic 回归结果显示年龄 ≥ 55 岁、侵入性操作、住院时间 ≥ 45 d、长期使用抗精神病药物和频繁使用抗菌药物治

表 4 住院精神病患者大肠埃希菌感染单因素分析[n(%)]

Table 4 Single factor analysis of *Escherichia coli* infection in psychiatric inpatients [n (%)]

Factors		n	Infected	Uninfected	χ^2	P
Gender	male	546	26(4.76)	520(95.24)	0.039	0.844
	female	554	25(4.51)	529(95.49)		
Age (years)	<55	884	20(2.26)	864(97.74)	57.380	0.000
	≥ 55	216	31(14.35)	185(85.65)		
Long term use of antipsychotics	yes	752	43(5.72)	709(94.28)	6.291	0.012
	no	348	8(2.30)	340(97.70)		
Length of stay(d)	≥ 45	355	30(8.45)	325(91.55)	17.248	0.000
	<45	745	21(2.82)	724(97.18)		
Season	Spring	223	10(4.48)	213(95.52)	0.107	0.754
	Summer	287	14(4.88)	273(95.12)		
	Autumn	291	14(4.81)	277(95.19)		
	Winter	299	13(4.35)	286(95.65)		
Types of psychosis	Schizophrenia	429	30(6.99)	399(93.01)	5.097	0.089
	Organic mental disorder	110	6(5.45)	104(94.55)		
	Others	561	15(2.67)	546(97.33)		
Frequent use of antibiotics	yes	365	42(11.51)	323(88.49)	58.319	0.000
	no	735	9(1.22)	726(98.78)		
Invasive operation	yes	41	18(43.90)	23(56.10)	148.510	0.000
	no	1059	33(3.12)	1026(96.88)		
Combined with other diseases	yes	308	13(4.22)	295(95.78)	0.167	0.683
	no	792	38(4.78)	754(95.22)		

表 5 住院精神病患者大肠埃希菌感染多因素 Logistic 回归分析

Table 5 Multivariate logistic regression analysis of *Escherichia coli* infection in psychiatric inpatients

Factors	assignment	β	SE	Wald χ^2	P	OR	95%CI
Age	≥ 55year=1, <55 year=0	0.849	0.137	6.463	0.018	1.832	1.183~3.092
Long term use of antipsychotics	Yes=1, no=0	0.695	0.109	10.311	0.001	1.939	1.241~3.189
Length of stay	≥ 45d=1, <45d=0	0.294	0.019	7.066	0.011	1.546	1.043~1.942
Invasive operation	Yes=1, no=0	0.230	0.027	9.038	0.004	1.658	1.068~1.973
Frequent use of antibiotics	Yes=1, no=0	0.742	0.093	18.813	0.001	2.797	1.131~3.412

疗是住院精神病患者大肠埃希菌感染的危险因素,分析其原因可能是由于随着患者年龄的升高,其免疫能力下降,导致大肠埃希菌感染易感^[21,22]。抗精神病药物治疗会引起患者炎症水平的升高,研究报道显示抗精神病药物会导致患者体内 C 反应蛋白(C-reactive protein,CRP)水平升高,因此抗精神病药物治疗可能通过上调 CRP 水平使得患者体内炎症水平升高,进而引起免疫机能紊乱,导致大肠埃希菌感染^[23]。手术等侵入性操作增加感染风险的报道较为多见,可见临床中应尽量减少侵入性操作,以减少感染几率^[24,25]。而抗菌药物治疗会导致患者体内已有的菌群分布发生改变,导致菌群分布发生紊乱,使得大肠埃希菌形成生长优势,导致大肠埃希菌大量繁殖。同时抗菌药物的长期使用会造成大肠埃希菌形成药物耐药性,使得大肠埃希菌感染加剧^[26,27]。住院时间≥ 45 d 是危险因素可能是由于医院接收的各类病人较多,携带的病原菌较多,住院时间的延长使得患者更易接触到这些病原菌,因此住院时间较长的患者容易

感染^[28-30]。

综上所述,大肠埃希菌耐药性日趋严重,对氨苄西林、四环素、环丙沙星、头孢唑啉的耐药率均已超过 70%,且年龄≥ 55 岁、长期使用抗精神病药物和使用抗菌药物治疗、侵入性操作、住院时间较长均是大肠埃希菌感染的危险因素,临床需加强精神疾病的治疗与护理,缩短住院时间,降低精神病患者的易感性,加强实验室工作人员与临床医生之间的联系,及时了解细菌的耐药情况,临床应根据药敏试验结果及精神病患者实际情况合理制定治疗方案,以降低大肠埃希菌感染风险。

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