

doi: 10.13241/j.cnki.pmb.2014.36.033

宫腔镜与阴道超声用于诊断子宫内膜病变的临床价值探讨*

曹迎九¹ 吕蓓¹ 王倩¹ 黄劲松¹ 王玉东²

(1 南京医科大学附属无锡市人民医院妇产科 江苏 无锡 214000; 2 上海交通大学附属国际和平妇幼保健院妇产科 上海 200000)

摘要 目的:探究阴道超声与宫腔镜对诊断子宫内膜病变的临床应用价值。**方法:**选取我院妇产科收治的子宫内膜病变患者 153 例,进行阴道超声及宫腔镜检查,观测患者病变类型以及病变部位,比较术后患者临床资料与术前阴道超声以及宫腔镜的检测结果,对阴道超声及宫腔镜的准确率、敏感性、阳性预测率以及阴性预测率等进行比较。**结果:**阴道超声检测内膜增生漏诊 3 例、内膜息肉误诊 3 例、粘膜下肌瘤误诊 2 例、内膜炎漏诊 2 例、内膜癌漏诊 1 例;宫腔镜检查检测内膜息肉误诊 1 例、黏膜下肌层误诊 2 例、内膜炎漏诊 1 例;与病理活检结果的符合率比较,宫腔镜的总符合率显著高于阴道超声,差异有统计学意义($P < 0.05$)。宫腔镜检查检测子宫内膜病变的准确率、敏感性、阳性预测率及阴性预测率显著优于阴道超声,差异有统计学意义($P < 0.05$)。**结论:**阴道超声和宫腔镜均可检测子宫内膜病变,前者操作简单、创伤小,后者操作复杂,但检出率、准确率及敏感度均较高,可减少临床误诊、漏诊的发生率。

关键词: 阴道超声;宫腔镜;子宫内膜病变;病理活检;诊断价值

中图分类号:R445.1;R711.71 文献标识码:A 文章编号:1673-6273(2014)36-7126-04

Comparative Study of Vaginal Ultrasonography and Hysteroscopy in Diagnosis of Endometrial Lesions*

CAO Ying-jiu¹, LV Bei¹, WANG Qian¹, HUANG Jin-song¹, WANG Yu-dong²

(1 Department of Obstetrics and Gynecology, People's Hospital in Wuxi City, Affiliated to Nanjing Medical College, Wuxi, Jiangsu, 214000, China; 2 Department of Obstetrics and Gynecology, Shanghai Jiao Tong University Affiliated International Peace Maternity and Child Health Hospital, Shanghai, 200000, China)

ABSTRACT Objective: To explore the clinical application value of transvaginal ultrasound and hysteroscopy in the diagnosis of endometrial lesions. **Methods:** 153 patients with endometrial lesions were treated from obstetrics and gynecology in our hospital. Vaginal ultrasound, hysteroscopy and pathological biopsy was used to detect the type and site of endometrial lesions. The accuracy, sensitivity, positive predictive value and negative predictive value of transvaginal sonography and hysteroscopy were compared. **Results:** ① Compared with pathological biopsy results, transvaginal ultrasound detection showed 3 cases of missed intimal hyperplasia, 3 cases of misdiagnosis of endometrial polyps, 2 cases of submucosal fibroids misdiagnosed, 2 cases of the meningitis missed, and 1 case of endometrial cancer misdiagnosis; ② compared with biopsy results, hysteroscopy showed one case of misdiagnosis polyps, 2 cases of submucous myoma misdiagnosed, and one case of the meningitis missed; ③ the overall compliance rate by hysteroscopy matched with pathological biopsy results was significantly higher than that of hysteroscopy, and the difference was statistically significant ($P < 0.05$). ④ in comparison with the detection accuracy, sensitivity, positive predictive value and negative predictive value for endometrial lesion, hysteroscopy was superior to vaginal ultrasound, and the difference was statistically significant ($P < 0.05$). **Conclusion:** Both of vaginal ultrasonography and hysteroscopy can detect endometrial lesions. Vaginal ultrasound is simple with no medical trauma; and hysteroscopy is complex, but it has high accuracy, high sensitivity which can reduce the misdiagnosis and missed diagnosis of endometrial lesions.

Key words: Ultrasound; Hysteroscopy; Endometrial lesions; Pathological biopsy; Diagnostic value

Chinese Library Classification(CLC):R445.1; R711.71 **Document code:** A

Article ID:1673-6273(2014)36-7126-04

前言

子宫内膜病变,是一类妇科常见的子宫内膜疾病,包括子宫内膜增生、内膜炎症、内膜息肉、内膜萎缩以及内膜癌等。临床多表现为腹部疼痛、白带异常、经期紊乱、闭经,甚至导致孕龄期女性不孕。有关数据显示^[1,2],子宫内膜病变,是妇科最为常

见的一种妇科疾病,我国每年患子宫内膜疾病的女性约占所有妇科疾病的 89.3% 以上,且呈逐年增加趋势。子宫内膜病变患者的误诊、漏诊率较一般内科疾病几率大,因为子宫内膜结构较复杂,且处于盆腔底部,部分病变不易被查出。为了提高子宫内膜疾病的早期诊断准确率,减少因误诊、漏诊延误治疗,给患者的病情带来的不良后果,国内外许多专家学者,对此进行

* 基金项目:国家自然科学基金项目(81172477)

作者简介:曹迎九(1969-),女,本科,副主任医师,主要研究方向:妇科肿瘤

(收稿日期:2014-07-10 接受日期:2014-08-08)

了大量研究。有关研究表明,子宫内膜疾病的早期诊断可采取阴道超声和宫腔镜等手段。研究显示^[3,4],阴道超声,是一种将探头直入阴道内部,进行体内超声成像的一种诊断技术,可通过电脑成像观测子宫结构、大小、内膜厚度、以及体内卵泡等,医疗人员通过对超声图像的分析,寻找病变部位,通过手术进一步治疗;宫腔镜,通过宫颈管,探入子宫内部,将探头完全深入子宫,连接计算机,得到子宫内部的清晰图像,医生通过观察,找出可疑病灶,并结合电子刀,刮取病变组织,进一步进行病理活检。两种诊断方式,均是当下妇产科诊断子宫内膜病变的主要手段。为了探究这两种诊断方法对子宫内膜病变的诊断准确性、敏感性等,我们通过对既往文献的研究分析,结合临床,对我院 153 例子官内膜病变患者进行了相关研究。现报道如下。

1 资料与方法

1.1 一般资料

选取 2011 年 3 月 -2014 年 3 月, 我院妇产科收治的子宫内膜病变患者 153 例,全部患者入院前已进行阴道超声,入院后行宫腔镜检查,同时提取病变组织进行病理活检,根据患者实验室检测结果,安排手术治疗。患者平均年龄 42.8 ± 10.2 岁,患者年龄、职业、出生地等一般资料相仿,差异无统计学意义 ($P > 0.05$)。纳入标准:参照中华医学会制定的《妇产科诊断标准》(2013 版)^[5],经阴道超声、宫腔镜等实验室检测确诊为子宫内膜病变;年龄在 38-68 岁;患者无肝、脾、肾等脏器的严重病变;意识清醒;患者自愿参与本次研究,并签署知情同意书。排除标准:参照《妇产科临床诊断指南》^[6],排除年龄超过 75 周岁;心、肺、肾等重要脏器有严重器质性病变;近 2 个月内进行过心脏手术;意识障碍、无语言表达能力;患者不愿参与本次研究。

1.2 方法

患者入院前,行阴道超声检测,患者检测前排空膀胱,将探

头倾斜推入阴道进行多方位探测,同时用左手适当按压腹部,减少肠气干扰,检测子宫形态、大小、基层组织以及血流流量等。患者入院后,行血常规、凝血功能、肝肾功能、心电图、胸片、白带常规检测,排除手术禁忌症后,行宫腔镜检查,并摘取可疑组织进行病理活检。宫腔镜检查,将宫颈管接通宫腔镜探头,深入子宫内,观测宫腔内情况以及子宫附件形态、内膜厚度以及病变部位的大小、血管分布以及病理增生组织等,同时进行电切刀,刮出部分病理组织,进行病理活检。病理活检,提取病理组织,在显微镜下观察,最终确定病理类型及疾病种类。患者进行检测后,均根据检查结果进行手术治疗,将患者术后临床资料与术前的实验室诊断进行比较。

1.3 观察指标

阴道超声与病理活检的结果比较、宫腔镜与病理活检的结果比较,以及两者结果的符合率、准确率、敏感性、阳性预测率、阴性预测率等。

1.4 统计学方法

采用统计学软件 SPSS 18.0 进行统计学分析,将统计评估及检测所得数据采用统计学软件进行统计分析,计量资料及计数资料分别进行 t 检验处理及卡方检验处理, $P < 0.05$ 为差异显著,有统计学意义。

2 结果

2.1 阴道超声、宫腔镜与病理活检诊断结果比较

与病理活检结果比较,阴道超声检测内膜增生(Hyperplasia)漏诊 3 例、内膜息肉(Polyps)误诊 3 例、粘膜下肌瘤(Submucous myoma)误诊 2 例、内膜炎(Endocarditis)漏诊 2 例、内膜癌(Carcinoma)漏诊 1 例。宫腔镜检查内膜息肉误诊 1 例、黏膜下肌层误诊 2 例、内膜炎漏诊 3 例。见表 1。

表 1 阴道超声、宫腔镜与病理活检结果(n)

Table 1 Results of ultrasound, hysteroscopy and biopsy (n)

	Hyperplasia	Polyps	Atrophy	Submucous myoma	Endocarditis	Carcinoma	Total
Biopsy	24	37	42	19	26	5	153
Hysteroscopy	24	38	42	21	22	5	152
Ultrasound	21	40	42	21	24	4	152

2.2 阴道超声、宫腔镜与病理活检的符合率比较

阴道超声、宫腔镜与病理活检结果的符合率比较,宫腔镜

的总符合率显著高于阴道超声,差异有统计学意义 ($P < 0.05$)。见表 2。

表 2 阴道超声、宫腔镜与病理活检结果的符合率情况(例)

Table 2 Results of the detection rate of ultrasound, hysteroscopy and pathological biopsy (cases)

	Hyperplasia	Polyps	Atrophy	Submucous myoma	Endocarditis	Carcinoma	detection Rate
Ultrasound	87.5 %	92.5%	100 %	90.5 %	92.3 %	80 %	92.1 %
Hysteroscopy	100 %	97.4%	100 %	90.5 %	96.2 %	100 %	97.3 % [▲]

Note: [▲] $P < 0.05$, Compared with transvaginal ultrasound.

2.3 两种方法诊断的准确率、敏感性、阳性预测率及阴性预测率

子宫内膜病变检测的准确率、敏感性、阳性预测率以及阴

性预测率比较,宫腔镜显著优于阴道超声,差异有统计学意义 ($P < 0.05$),具体情况,见表 3。

表 3 准确率、敏感性、阳性预测率以及阴性预测率比较(%)

Table3 Comparison of the accuracy, sensitivity, positive and negative predictive rate (%)

Group	Accuracy rate	Sensitivity	Positive rate	Negative rate
Ultrasound	87.6%	91.4%	89.6%	65.9%
Hysteroscopy	92.4 % [▲]	95.2 % [▲]	96.3 % [▲]	91.1 % [▲]

Note: [▲]P<0.05, compared with transvaginal ultrasound.

3 讨论

有关数据显示^[7-10],我国每年患子宫内膜疾病的女性可达2900万,约占妇科疾病总数的62%,且呈逐年增加趋势。为了减少子宫内膜疾病对女性生理及心理带来的创伤,提高子宫内膜疾病的早期检出率,降低误诊、漏诊率,国内外许多专家学者进行了大量研究。有关研究表明^[11-14],子宫内膜疾病的早期诊断可采取阴道超声和宫腔镜等手段。两种观测方法,均可观察子宫的内部情况,对子宫内膜病变的早期诊断有显著的效果^[16]。

本实验中,阴道超声与病理活检结果比较显示,阴道超声检测的内膜增生、内膜息肉、粘膜下肌瘤、内膜炎、内膜癌以及总患者数目与病理活检存在差异(P<0.05)。李荣环^[17]等对109例子官内膜病变患者进行了阴道超声检测,并进行病理活检,结果表明阴道超声诊断的结果与病理活检的结果有一定误差,由于子宫内膜分层后,部分病变组织处于夹层之中,超声诊断未能查出病灶部位,因而产生了漏诊及误诊。宫腔镜与病理活检结果比较显示,宫腔镜检测的内膜息肉、黏膜下肌层、内膜炎的患者数目与病理活检结果存在差异(P<0.05)。翟科^[18]等对112例疑似子宫内膜病变患者进行了宫腔镜检查,发现其中有110例患者为阳性,这一结果与实际病理活检结果一致,但其中部分患者的病理类型诊断有误,说明宫腔镜对子宫内膜病变的检出率较高,但也存在一定的误差。阴道超声、宫腔镜与病理活检结果的符合率比较,宫腔镜的总符合率显著高于阴道超声,差异有统计学意义(P<0.05)。文玉霞^[19]等对190例子官内膜炎患者进行了不同诊断,根据诊断结果进行手术治疗,术后发现患者资料与诊断存在部分误差,且阴道超声诊断的误差相对宫腔镜诊断的误差明显,说明宫腔镜诊断子宫内膜病变,更具有准确性。子宫内膜病变检测的准确率、敏感性、阳性预测率以及阴性预测率比较,宫腔镜显著优于阴道超声,差异有统计学意义(P<0.05)。张敏^[20]等对2010年-2012年妇产科收治的子宫内膜病变患者进行了回顾性研究,发现经宫腔镜诊断的患者,其诊断准确率高于阴道超声诊断,且敏感性较高,对疾病的预测率也相对较大,我们的研究结果与此相符,提示宫腔镜是早期诊断子宫内膜病变的首选方式。

综上所述,阴道超声和宫腔镜检测均能较有效的诊断女性子宫内膜病变,宫腔镜对于子宫内膜病变的诊断准确率高、敏感性强、预测率较好,但由于深入子宫内部,操作时易产生轻度的医疗损伤,且费用高;阴道超声,虽然操作简便,不易产生损伤,但由于其探头深入体内的局限性,导致部分患者的病理类型判断错误,尤其对于较相似的病灶类型,存在一定的误诊率。两种诊断方式均有其自身的优劣势,临床上可根据不同需要,进行合理选择。

参考文献(References)

- [1] 李瑞玉,张丽丽,尹娟,等. 宫腔镜结合阴道超声对绝经后妇女子宫内膜病变的临床应用[J]. 中国医药导刊, 2013, 13(1): 117-118
Li Rui-yu, Zhang Li-li, Yin Juan, et al. Hysteroscopy combined with vaginal ultrasonography in postmenopausal endometrial lesions in clinical application[J]. China medical Tribune, 2013, 13(1): 117-118
- [2] 彭基,吴雪玲,廖燕桃,等. 腹部超声和经阴道超声对子宫内膜病变诊断的比较[J]. 中国医药指南, 2011, 09(16): 283-284
Peng Ji, Wu Xue-ling, Liao Yan-tao, et al. Comparison of abdominal ultrasonography and transvaginal ultrasonography in diagnosis [J]. Chinese medicine guidelines, 2011, 09(16): 283-284
- [3] 武红. 宫腔镜在绝经后妇女子宫内膜病变诊断中的应用[J]. 中国现代药物应用, 2014, 8(2): 68-69
Wu Hong. Hysteroscopy in the diagnosis of endometrial lesions in postmenopausal women [J]. Journal of Chinese modern medicine application, 2014, 8(2): 68-69
- [4] 陈亚琳,白峰,弓卫东,等. 超声联合宫腔镜诊断不孕患者子宫内膜异常的价值[J]. 新疆医学, 2011, 41(7): 40-43
Chen Ya-lin, Bai Feng, Gong Wei-dong, et al. Value of ultrasound combined with hysteroscopy in the diagnosis of infertile patients [J]. Journal of medicine in Xinjiang, 2011, 41(7): 40-43
- [5] 潘秋丽. 经阴道超声、宫腔镜对子宫内膜病变诊断价值的研究[D]. 山东大学, 2012
Pan Qiu-li. Diagnostic value of transvaginal sonography and hysteroscopy for uterine endometrial lesions [D]. Shandong University, 2012
- [6] 赵海英,宋宏丽. 阴道超声与宫腔镜诊断子宫内膜息肉的讨论[J]. 中国医药指南, 2011, 09(25): 274-275
Zhao Hai-ying, Song Hong-li. Discussion of transvaginal sonography and hysteroscopy in the diagnosis of uterine endometrial polyps [J]. Chinese medicine guidelines, 2011, 09(25): 274-275
- [7] 张韬,赵峰,陈悦,等. 经阴道超声宫腔造影对子宫内膜病变的诊断意义[J]. 上海医学影像, 2012, 21(2): 113-115, 120
Zhang Tao, Zhao Feng, Chen Yue, et al. Value of transvaginal ultrasonographic hysteroscopy in diagnosis of endometrial disease [J]. Journal of Shanghai medical imaging, 2012, 21(2): 113-115, 120
- [8] 黎小玲. 经阴道超声和宫腔镜检查对不孕患者子宫内膜病变的诊断价值[J]. 健康之路, 2014, 14(6): 47
Li Xiao-ling. Transvaginal ultrasonography and hysteroscopy examination to assess the diagnostic value of endometrial lesions in patients with infertility [J]. Road to health, 2014, (6): 47
- [9] 徐平,张敏. 经阴道超声检查对子宫内膜病变初筛的临床价值[J]. 临床超声医学杂志, 2010, 12(12): 857-858
Xu Ping, Zhang Min. Clinical value of Transvaginal ultrasound examination for the early screening of endometrial lesions [J]. Journal

- of clinical ultrasound medical journal, 2010, 12(12): 857-858
- [10] 许颖, 赵亚萍, 梅枚, 等. 经阴道超声联合宫腔镜检查对子宫内膜息肉的诊断价值[J]. 临床超声医学杂志, 2012, 14(7): 500-501
Xu Ying, Zhao Ya-ping, Mei Quan, et al. Diagnosis value of transvaginal ultrasonography combined hysteroscopy examination in the endometrial polyps [J]. Journal of clinical ultrasound medical journal, 2012, 14(7): 500-501
- [11] Touhami O, Gregoire J, Noel P. Uterine arteriovenous malformations following gestational trophoblastic neoplasia: a systematic review[J]. Eur J Obstet Gynecol Reprod Biol, 2014, 30, 181C: 54-59
- [12] Ferrer MS, Miesner M, Anderson DE. Ultrasonographic fetal parameters and neonatal survival in somatic cell nuclear transfer-derived beef calves [J]. Theriogenology, 2014, 1. pii: S0093-691X(14)00313-6
- [13] 夏红, 赵勇锋, 李怀芳, 等. 宫腔镜、腹腔镜联合在不孕症诊治中的应用[J]. 同济大学学报(医学版), 2009, 30(3): 100-102
Xia Hong, Zhao Yong-feng, Li Huai-fang, et al. Hysteroscopy and laparoscopy combined application in the diagnosis and treatment of infertility [J]. Journal of tongji university (medical edition), 2009, 30 (3): 100-102
- [14] 吕涛, 刘艳丽, 吕晓玉, 等. 阴道超声与宫腔镜检查诊断绝经后出血的价值对比[J]. 中国老年学杂志, 2013, 33(15): 3797-3798
Lv Tao, Liu Yan-li, Lv Xiao-yu, et al. Value of contrast ultrasonography and hysteroscopy in diagnosis of vaginal bleeding after menopause [J]. Chinese journal of gerontology, 2013, 33(15): 3797-3798
- [15] 李小玲, 曾慧, 李敬菲, 等. 阴道超声联合宫腔镜诊治子宫内膜息肉的临床分析[J]. 河北医药, 2010, 32(16): 2215-2216
Li Xiao-ling, Zeng Hui, Li Jing-fei, et al. Clinical analysis of transvaginal ultrasound combined with hysteroscopy in the diagnosis and treatment of uterine endometrial polyps [J]. Journal of hebei medicine, 2010, 32(16): 2215-2216
- [16] 张敏, 杜敏, 李宝艳, 等. 阴道超声联合宫腔镜对体外受精-胚胎移植失败的诊治价值[J]. 医学综述, 2012, 18(15): 2522-2524
Zhang Min, Du Min, Li Bao-yan, et al. Clinical value of transplantation transvaginal ultrasound combined with hysteroscopy in patients who failed IVF-ET [J]. Journal of medicine, 2012, 18(15): 2522-2524
- [17] 李荣环, 杨欣, 黄宝阳, 等. 宫腔镜在绝经后妇女宫腔积液的诊断价值[J]. 山西医科大学学报, 2011, 42(2): 162-164
Li Rong-huan, Yang Xin, Huang Bao-yang, et al. Diagnostic value of hysteroscopy in postmenopausal uterine cavity effusion [J]. Journal of shanxi medical university, 2011, 42(2): 162-164
- [18] 翟科一, 朱丽萍, 尹维, 等. 经阴道超声宫腔声学造影和宫腔镜诊断子宫内膜病变的比较性研究 [J]. 中国农村卫生, 2014, 14(2): 162-162, 163
Jai Ke-yi, Zhu Li-ping, Yin Wei, et al. Comparative study of transvaginal ultrasonic sonohysterography and hysteroscopy diagnosed of Endometrial lesions [J]. Journal of China rural health, 2014, 14(2): 162-162, 163
- [19] 文玉霞. 经阴道彩色多普勒超声在诊断子宫内膜病变中的临床应用价值[J]. 中国保健营养(下旬刊), 2014, 14(1): 546-547
Wen Yu-xia. Clinical value of transvaginal color Doppler ultrasound in the diagnosis of endometrial lesions. [J]. China's health care nutrition, 2014, 14(1): 546-547
- [20] 张敏, 陈萍, 陈桂英, 等. 阴道超声宫腔造影联合宫腔镜诊断子宫腔内疾病的价值[J]. 临床和实验医学志, 2010, 09(14): 1103-1104
Zhang Min, Chen Ping Chen Gui-ying, et al. Value of diagnosis of endometrial lesions by transvaginal ultrasonic hystero-graphy combined with hysteroscopy [J]. Journal of clinical and laboratory medicine, 2010, 09(14): 1103-1104

(上接第 7089 页)

- [12] 张天哲, 于立群, 陈银苹, 等. 幽门螺杆菌感染与胃癌关系的 Meta 分析[J]. 现代预防医学, 2009, 09: 1601-1604
Zhang Tian-zhe, Yu Li-qun, Chen Yin-ping, et al. Relationship between helicobacter pylori infection and gastric cancer [J]. Modern Preventive Medicine, 2009, 09: 1601-1604
- [13] 王海珍, 孙聪. 幽门螺杆菌感染与胃部疾病的相关性[J]. 中国肿瘤, 2014, 03: 214-217
Wang Hai-zhen, Sun Cong. The correlation of helicobacter pylori infection and gastric diseases[J]. China Cancer, 2014, 03: 214-217
- [14] 周文斌, 李志英. 上消化道疾病患者幽门螺杆菌感染情况分析[J]. 中华医院感染学杂志, 2012, 05: 962-963
Zhou Wen-bin, Li Zhi-ying. The situation analysis of helicobacter pylori infection in patients with upper gastrointestinal diseases [J]. Chinese Journal of Nosocomiology, 2012, 05: 962-963
- [15] Camila A Figueiredo, Cintia Rodrigues Marques, Ryan dos Santos Costa, et al. Cytokines, cytokine gene polymorphisms and Helicobacter pylori infection: Friend or foe?[J]. World J Gastroenterol, 2014, 20(18): 5235-5243
- [16] Liu K, Song X, Ma H, et al. Knockdown of BAMBI inhibits β -catenin and transforming growth factor β to suppress metastasis of gastric cancer cells[J]. Molecular medicine reports, 2014, 10(2): 874-880
- [17] Yang Ze-min, Chen Wei-wen, Wang Ying-fang. Gene Expression Profiling in Gastric Mucosa from Helicobacter pylori-Infected and Uninfected Patients Undergoing Chronic Superficial Gastritis [J]. PLoS One, 2012, 7(3): e33030
- [18] Yeon-Mi Ryu, Seung-Jae Myung, Young Soo Park, et al. Inhibition of 15-hydroxyprostaglandin dehydrogenase by Helicobacter pylori in Human Gastric Carcinogenesis[J]. Cancer Prev Res, 2013, 6(4): 349-359
- [19] Ravinder Naik Noonavath, Chandrasekharan Padma Lakshmi, Tarun Kumar Dutta, et al. Helicobacter pylori eradication in patients with chronic immune thrombocytopenic purpura[J]. World J Gastroenterol, 2014, 20(22): 6918-6923
- [20] Michael Kotiw, Megan Johnson, Manisha Pandey, et al. Immunological Response to Parenteral Vaccination with Recombinant Hepatitis B Virus Surface Antigen Virus-Like Particles Expressing Helicobacter pylori KatA Epitopes in a Murine H. pylori Challenge Model[J]. Clin Vaccine Immunol, 2012, 19(2): 268-276