

Comparison of Two Papanicolaou Smear Techniques in a Family Practice Setting

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Papanicolaou smear adequacy is directly dependent upon endocervical cell recovery. Ineffective physician sampling techniques and advancing patient age are responsible for most inadequate smears. Two thousand four hundred seventy-eight routine Papanicolaou smears were reviewed from the Department of Family Practice and the Department of Gynecology for the presence of these cells. A retrospective review showed approximately 25 percent cell recovery in women aged over 45 years from both departments. Recovery on the family practice service, however, was 19.4 percent greater than recovery on the gynecology service for younger women (57 percent vs 37.6 percent).

Two prospective interventions were introduced in family practice in an attempt to improve these rates. A combined spatula-saline swab technique did not improve cell recovery in either age group. A combined spatula-Cytobrush cell collector technique, however, dramatically improved endocervical cell recovery by 200 percent in older women and by 57 percent in younger women. This method significantly improves endocervical cell recovery and may therefore improve the value of the Papanicolaou smear as a cancer screening test.

The Papanicolaou smear was introduced in the early 1940s and is the accepted screening test for detecting cervical cytologic abnormalities. Papanicolaou smear adequacy is directly dependent on the recovery of columnar endocervical cells from the squamocolumnar junction,¹⁻⁶ because most cervical dysplasia begins at this location. The percentage of nondiagnostic Papanicolaou smears is reported to be as high as 50 to 69 percent^{4,5} and is attributed to several factors, including physician sampling error, laboratory error, and patient factors. Physician sampling error is probably the most significant contributing factor to the inadequate smear.^{7,8} Recent controversy regarding recommended screening intervals has resulted in less frequent screening for women in low-risk categories. This increased screening interval underscores the need to minimize the inadequate smear rate,⁹ and several investigators recommend that a smear be repeated if endocervical cells are absent.^{2,3}

To reduce physician sampling error, various methods of endocervical sampling have been developed. These methods, used in various combinations, include wood or plastic spatulas, wet or dry cotton swabs, endocervical aspiration devices, and the newer bristle brushes.

The purpose of this study was to analyze retrospectively the endocervical cell recovery rate from routine, annual Papanicolaou smears performed at Martin Army Hospital by the Department of Family Practice and the Department of Gynecology.

Having established a baseline, two standardized techniques were prospectively studied in the Family Practice Clinic in an effort to improve on the baseline endocervical cell recovery rate. The first technique utilized an extended-tip plastic spatula* followed by a moist saline swab. This combination has been reported to improve endocervical recovery to as high as 63 percent in postmenopausal women.¹⁰ The second technique utilized the extended-tip plastic spatula followed by the recently introduced bristle brush cell collector, the Cytobrush^{1,2} cell collector.**

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* Millex spatula, Millex Products Inc, Chicago, Illinois.

** Cytobrush cell collector, Medscand AB, Malmo, Sweden, distributed in the United States as Zelsmyr Cytobrush cell collector, by International Cytobrush Inc, Hollywood, Florida.

METHODS

The study was undertaken from August 1986 to May 1987 in the Family Practice Clinic at Martin Army Community Hospital. This 345-bed teaching hospital serves soldiers, their families, and the retired military population of approximately 100,000 people at Ft. Benning, Georgia. The Family Practice Clinic is staffed by ten physicians and 27 residents at various levels of training. There was no provider turnover in the Family Practice Clinic during this study.

The Gynecology Clinic has five gynecologists and one gynecology nurse practitioner. There was no physician turnover in the Gynecology Clinic throughout the study; however, the nurse practitioner left at the onset of phase 3 and was replaced with another nurse practitioner.

Currently there is no uniform policy regarding how to proceed if a report is returned indicating no endocervical cells were present. Some physicians will repeat the smears, whereas others choose not to do so.

Cytologic evaluation was performed by the same two certified cytotechnicians throughout the study. Slides were read, coded by number, and matched with clinic and physician of origin after interpretation. All reports were annotated routinely regarding the presence or absence of endocervical cells. Pregnant women and those who had undergone hysterectomies were excluded from the study, as were women referred to the Gynecology Clinic for abnormal smears. In addition, Papanicolaou smears performed by family practice residents in the Gynecology Clinic were excluded from the study.

Phase 1 involved a four-month retrospective analysis of all routine, annual Papanicolaou smears reported by all techniques from August through November 1986. Phase 1 was undertaken to determine the endocervical cell recovery rate from the Family Practice Clinic and Gynecology Clinic as well as the overall hospital recovery rate.

Phase 2, which took place over a two-month period, introduced a standardized Papanicolaou smear technique in the Family Practice Clinic utilizing an extended-tip plastic spatula followed by a moist saline swab.¹⁰

The extended-tip plastic spatula is inserted into the cervical os, rotated 360 degrees and then transferred to the long axis of one half of the slide. The moist saline swab is then inserted into the cervical os, rotated 360 degrees and then transferred to the remaining half of the slide with a rolling motion. The slide is then fixed immediately.

The protocol for the study was explained to family physicians by memorandum and lecture demonstration. Papanicolaou smear forms were annotated by the physician at the time of the smear to verify that the study protocol was followed. No intervention was undertaken in the Gynecology Clinic, nor were the gynecologists aware

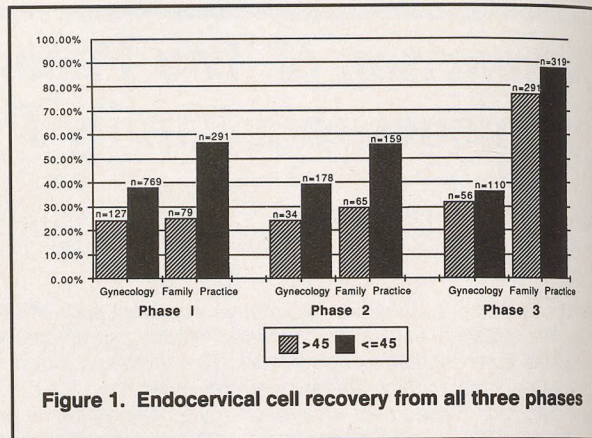


Figure 1. Endocervical cell recovery from all three phases

that a study was ongoing in the Family Practice Clinic; therefore, the Gynecology Clinic patient specimens functioned as controls for the intervention.

Phase 3 introduced a technique of using a standardized spatula-Cytobrush cell collector combination for a two-month period in the Family Practice Clinic. The same mechanism was used as in phase 2 to assure that the study protocol was followed. The phase 3 technique utilized extended-tip plastic spatulas followed by the Cytobrush cell collector. The procedure to make the smear was the same as the method described above for phase 2. The Cytobrush cell collector replaced the saline swab. Again, no intervention was undertaken in the Gynecology Clinic. Data were tabulated by clinic and by patient age (45 years or younger, or over 45 years).

Statistical analysis of data was performed by the chi-square method, and results were considered significant at $P < .05$.

RESULTS

Two thousand four hundred seventy-eight Papanicolaou smear reports were reviewed and tabulated.

Analysis of the four-month retrospective baseline (phase 1) yielded a total endocervical cell recovery rate of 40 percent for Martin Army Hospital (506/1266). Further breakdown of phase 1 data by patient age and department are shown in Figure 1.

Endocervical cell recovery was poorer in women aged over 45 years. There was no significant difference in endocervical cell recovery between clinics in the older-age category. In younger women, however, the yield of endocervical cells from the Family Practice Clinic was 19.4 percent greater than that from the Gynecology Clinic. This difference is statistically significant ($P < .005$).

Tabulation of 436 Papanicolaou smear reports from phase 2 showed a total hospital endocervical cell recovery rate of 42.7 percent (186/436). Further analysis of these data by patient age and department is shown in Figure 1.

With this technique of using a standardized extended-tip plastic spatula-saline swab combination in the Family Practice Clinic, there was no statistically significant improvement in endocervical cell recovery in either age group when compared with Family Practice Clinic baseline statistics. Gynecology Clinic results for controls for this phase showed percentages that were almost identical to their own baseline statistics.

During phase 3, 776 Papanicolaou smear reports were reviewed. The overall hospital endocervical cell recovery rate during this two-month period increased to 61.1 percent (474/776). Data breakdown by patient age and clinic are shown in Figure 1. Using the extended-tip plastic spatula-Cytobrush cell collector combination in the Family Practice Clinic, the endocervical recovery rates improved dramatically in both age categories. In women aged over 45 years, recovery increased by approximately 200 percent (to 76.4 percent). In women younger than or aged 45 years, endocervical cell recovery increased by approximately 57 percent (to 88 percent). These results were statistically significant ($P < .005$).

For the Gynecology Clinic patients older than 45 years, there was a slight increase in endocervical cell recovery to 32.1 percent, but this increase was not statistically significant. Results for women younger than 45 years were similar to those of the previous two phases.

The data obtained using the Cytobrush cell collector in phase 3 by the family physicians were categorized further by patient age and are shown in Figure 2.

These data suggest that the extended-tip plastic spatula-Cytobrush cell collector combination yields greater than 80 percent endocervical cell recovery through the sixth decade, after which recovery rates begin to fall off. Even in the eighth decade, however, endocervical cell recovery with this method is approximately twice as high as the baseline rate in older women (50 percent vs approximately 25 percent).

DISCUSSION

It is generally agreed that recovery of columnar endocervical cells from the squamocolumnar junction is necessary for a technically adequate Papanicolaou smear.¹⁻⁶ It is also well accepted that as a woman ages, recovery of these cells is more difficult because of the proximal migration of this junction.^{2,4,6} Gondos and Marshall¹¹ reported a false-negative incidence of 8 percent in women younger than age 45 years and 36 to 48 percent in women older than 45 years. Hamblin et al⁶ reported an endocervical

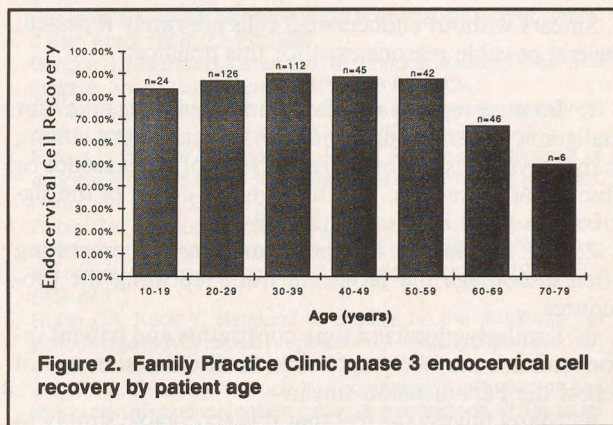


Figure 2. Family Practice Clinic phase 3 endocervical cell recovery by patient age

cell recovery rate of only 32 percent in postmenopausal women.

Although cervical cancer is the second most common malignancy in women aged 15 to 34 years, the incidence increases through the fifth decade and then levels off. Postmenopausal women are, therefore, also at significant risk and are less likely to have adequate smears.^{6,12} Many clinicians believe that Papanicolaou smear screening can be stopped after the age of 70 years.

Elias et al¹³ concluded there are significantly more atypical changes on abnormal smears that contain columnar endocervical cells compared with smears that contained only squamous cells.

Several studies have concentrated recently on improving smear techniques. Wood spatulas and cotton swabs are known to cause cellular trapping and may therefore be responsible for decreased transfer rates to the slide. The extended-tip plastic spatulas do not trap cells but may be less effective in harvesting them.¹⁴ Studies have also been conducted to examine patterns of smearing on slides and the amount of pressure exerted during the smear.^{15,16} Colon and Linz¹⁷ found extended-tip spatulas increased the yield of endocervical cells to 77 percent, but they did not differentiate recovery rates by patient age. Kivlahan and Ingram⁴ also found that extended-tip spatulas improved endocervical cell recovery. Brock et al¹⁰ reported the use of extended-tip spatulas followed by moist saline cotton swabs yielded the best recovery rates in postmenopausal women (63 percent). Trimbois and Arentz² and Glenthoj et al¹⁸ found the recently developed cervical Cytobrush cell collector to be more effective than the cotton swab in recovery of endocervical cells. Boon et al¹ introduced a combined Cytobrush cell collector-spatula technique and reported a 98 percent endocervical cell recovery rate as well as improved cellular morphology. This study also did not differentiate recovery rates by patient age.

Smears without endocervical cells are rarely repeated. Several possible reasons exist for this practice:

1. Because reports are often annotated "negative" for malignancy even though endocervical cells were absent, many physicians not only are unaware of the presence or absence of these cells, but they are not aware of the significance of the absence of the cells.
2. The cost factors of repeat sampling and processing often discourage the physician from repeating the procedure.
3. Similarly physician time constraints and patient inconvenience may be responsible for the decision to not repeat the Papanicolaou smear.
4. Many physicians feel that it is acceptable simply to wait until the next routine physical examination to repeat the smear.

There is also a subset of women who have repeat smears performed that do not contain endocervical cells on the second sample. There are no guidelines currently in the literature concerning what further action should be taken. Several studies have suggested looking for common characteristics among these women.

In this study the retrospective baseline data (phase 1) showed that the overall hospital endocervical recovery rate was poor. These data support prior studies in finding the lowest recovery rates in postmenopausal women.

Baseline comparison by clinic showed that the Family Practice Clinic had an endocervical cell recovery rate of approximately 20 percent better than the Gynecology Clinic in women younger than 45 years. This difference was statistically significant. The reason for this difference is uncertain. When compared by clinic, however, there was no significant difference in rates found during the retrospective baseline determination in women older than 45 years.

These poor rates by both clinics and the overall hospital recovery rate of 40 percent during this baseline period bring into question the value of the Papanicolaou smear as an adequate screening test. It is unknown, however, whether any cervical cancers were missed because of these poor rates.

Standardization of technique in the Family Practice Clinic using the combined extended-tip plastic spatula-saline swab technique (phase 2) did not support a prior study, which concluded that this method was superior in postmenopausal women. In their study, Brock et al.¹⁰ improved endocervical cell recovery to 63 percent. There was no statistically significant difference when compared with the Family Practice Clinic baseline results when this method was used in this study at Martin Army Hospital.

The second intervention in the Family Practice Clinic—utilizing the combined extended-tip plastic spatula-Cy-

tobrush technique (phase 3)—supports other studies concluding that this method significantly improves the endocervical cell recovery rate. Prior studies with the Cytobrush cell collector, however, have not factored in patient age. With this technique, the Family Practice Clinic increased the endocervical cell recovery rate by 57 percent in women younger than 45 years (to 88 percent) and by 200 percent in women older than 45 years (to 76.4 percent). Both categories were statistically significant.

When Family Practice Clinic data from phase 3 were evaluated further by patient age, cell recovery rates were uniformly high until the age of 60 years, at which time the recovery rate began to fall off. Recovery rates in the seventh and eighth decades using the Cytobrush method, moreover, still showed statistically significant improvement from the baseline percentages in women older than 45 years. The recommendation to stop screening women after age 70 may still be prudent, however, because this study indicates that the inadequate smear rate in this age range is still quite high (50 percent) even with the improved sampling methods.

A potential bias during this study concerned the awareness by the Family Practice Clinic physicians that a study was ongoing. Theoretically, the family physicians could have tried harder to get better Papanicolaou smears in the prospective phases of the study. In addition, patients could not be further randomized because of specific requirements of eligibility for care by the two clinics.

In summary, this study was performed to determine whether two methods could improve the recovery of endocervical cells during Papanicolaou smears. The following conclusions are made:

1. It is necessary to increase physician awareness regarding the importance of endocervical cell recovery during Papanicolaou smears.
2. This study finds no significant improvement in postmenopausal endocervical cell recovery with the extended-tip plastic spatula-saline swab method previously described by Brock et al.¹⁰
3. The extended-tip plastic spatula-Cytobrush cell collector technique reported herein is an effective method for improving significantly the endocervical cell recovery on Papanicolaou smears and may therefore improve the value of this cancer screening test. Use of this technique reduces dramatically the inadequate smear rate and the subsequent anxiety-provoking and costly return visits that are advised when endocervical cells are absent on a Papanicolaou smear.

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