

# Hans Frangenheim - Culdoscopy vs. Laparoscopy, the First Book on Gynecological Endoscopy, and "Cold Light"

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## ABSTRACT

In the United States, culdoscopy (a vaginal approach to view the abdomen) replaced laparoscopy for about 20 years, circa 1950-1970. In contrast to many of his colleagues, Hans Frangenheim of Wuppertal, Germany, was not satisfied with culdoscopy and turned to an abdominal approach. Frangenheim began publishing his experiences with gynecological laparoscopy in 1958 and stressed technical improvements. He constructed a CO<sub>2</sub> insufflator, wrote the first book on gynecological endoscopy, and introduced "cold light" into laparoscopy. Frangenheim strongly stimulated the rise of gynecological laparoscopy in Europe in the 1960s and later.

## Per Vaginum Into the Abdomen

Vaginal operations are even older than the introduction of anesthesia. Scholars assume that the first successful vaginal hysterectomy was performed in 1822 by Johann Nepomuk Sauter (1766-1840). Joseph Claude Recamier (1744-1856) followed in 1824, and Bernhard Rudolf Langenbeck (1810-1887) performed the operation nineteen years later. The Parisian surgeon Jules Pean (1830-1898) also gathered extensive experience in operations with the vaginal approach.<sup>1</sup>

The vaginal operation became better known in German-speaking areas with the work of Vinzenz Czerny (1842-1916), who described the vaginal hysterectomy in 1879.<sup>2</sup> In the 1890s, operations per vaginum had become so "popular," wrote the Breslau gynecologist, Baumm, "that in recent years, one has literally set one's heart on attacking all possible maladies of the female genitalia, for which until recently one had considered only the laparotomy, from the vagina."<sup>3</sup> Over the course of time, more and more voices spoke out against colpotomy, both anterior and posterior, in detailed discussions about a vaginal approach for operating. The Berlin gynecologist Robert Olshausen, for exam-

ple, demanded that "we finally build a common front against the senseless and dangerous expansion of the colpotomy."<sup>4</sup> Rudolf Chrobak (1843-1910), of Vienna, cautioned, "One can not always recognize the injuries which arise from the operation, while such injuries with laparotomies can be discovered immediately, and the necessary steps taken."<sup>5</sup> Johannes Pfannenstiel (1862-1909), also from Breslau, added his own council: "As a result of today's almost 0% mortality, we have certainly no higher death rate here than when we operate vaginally."<sup>6</sup>

Beginning in 1891, Dimitri Oskarovic von Ott (1855-1929), a Russian gynecologist from St. Petersburg, utilized normal incandescent light with a reflector for gynecological operations. The light was fastened to the forehead with a band (**Figure 1**). He also attached a mirror to the light, adjustable to the demands of the examination at hand.<sup>7</sup> Ott most frequently used "ventroscopy" for the postoperative examination of gynecological operations. In 1903, Ott reported on more than 606 operations carried out per vaginum.<sup>8</sup>

With advances in anesthesia and asepsis, the risks of abdominal operations decreased so radically that around 1900 the mortality rate of both vaginal and abdominal operations hovered around five percent. Vaginal access thus no longer offered significant advantages, and discussion promoting vaginal approaches soon faded.<sup>9</sup>

## Culdoscopy

In the late 1920s, Albert Decker, a surgeon at the Knickerbocker and Gouverneur Hospital in New York, began to use a peritoneoscope for viewing the abdominal cavity. "I started coelioscopy in 1928 and worked with it for ten or eleven years before giving it up," he noted.<sup>10</sup> Decker was aware that another physician, Ruddock, in California, was performing coelioscopies as well, but decided against pursuing this direction. "I gave up coelioscopy because it required general anesthesia," he recalled. "[A]nd I gave up doing any operative procedure through the coelioscopy because with a good anesthesia and the use of an operating room, I felt it was just as well to explore the abdomen and find out what was wrong, and at the same time correct the condition properly."

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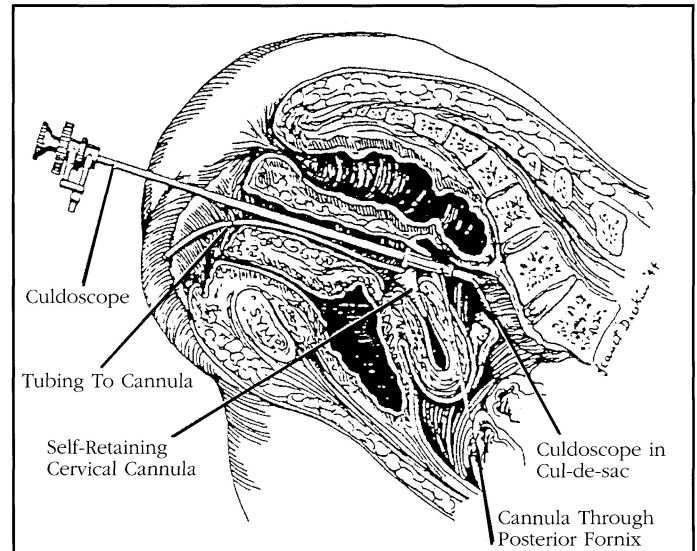


**Figure 1. Dimitri Oskarovic von Ott at work. (Figure 4-3 in *Highlights in the History of Laparoscopy*.)**

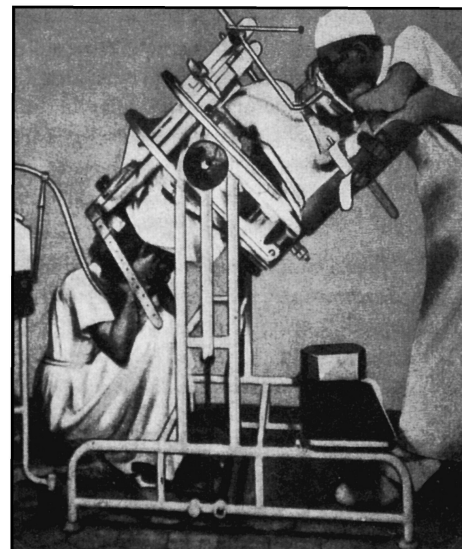
In 1942, Decker began to work exclusively in the gynecology department and soon turned to a vaginal approach to view the abdomen (**Figure 2**). "The route to the pelvis by abdominal puncture with the aid of vaginal manipulation and various postures did not give uniformly satisfactory results," explained Decker. He attributed the failure of proper visualization to the presence of intestinal loops and the inability to isolate the pelvic organs correctly. To solve this problem, Decker built an endoscopic instrument. The "Decker culdoscope" represented in principle a modified peritoneoscope, consisting of a trocar and an optical system. But the most important alteration involved not the instrument, but rather the investigatory technique: female patients were examined in the knee-chest position. "This method has several advantages," noted Decker. "Very few instruments are needed, the air enters the abdomen only if the tubes are patent, not spastic, and as a result of negative pressure."<sup>10</sup>

As World War II drew to a close, Decker began to advocate culdoscopy. He published a series of studies dating from 1944 to 1952 in the medical press.<sup>11</sup> This method won over many physicians in the United States and came to occupy a privileged space in the range of endoscopic examination methods then available. Decker encouraged the use of culdoscopy in the knee-elbow position, although it took at least four people to bring the female patient into this position, buttocks raised, and hold her there. The average length of an operation with a laparoscope, including general preparations and creation of a pneumoperitoneum, was about 30 minutes; a culdoscopy operation, in contrast, required only a few minutes (**Figure 3**).

Decker was so successful with his publications on the culdoscopy that for over 20 years this method was practically the only endoscopic examination of the abdominal cavity in the United States. As a German gynecologist put it, "In the majority of cases, the Anglo-American countries prefer the culdoscopy over the laparoscopy, most likely due to Decker's influence."<sup>12</sup>



**Figure 2. Culdoscopy according to Decker. (Figure 4-4 in *Highlights in the History of Laparoscopy*.)**



**Figure 3. In the USA culdoscopy replaced laparoscopy for over twenty years.**

### Gynecological Endoscopy in Germany, and Hans Frangenheim

At the conclusion of the second world war, Germany faced enormous difficulties. Countless towns and cities had been destroyed, some almost totally, and entire industrial branches had collapsed. The country was divided into four zones and remained under Allied administration until 1948. During this time Germany was essentially isolated from the rest of the world. For German physicians, this meant that they had almost no access to international scholarship after the war (nor had the National Socialist regime permitted much contact with outside science during its tenure). This situation persisted until the late 1940s. The first report on culdoscopy appeared in Germany in 1949.<sup>13</sup>

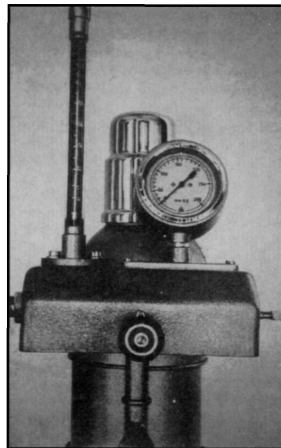


**Figure 4. Hans Frangenheim (b. 1920).**  
(Figure 5-2 in *Highlights in the History of Laparoscopy*.)

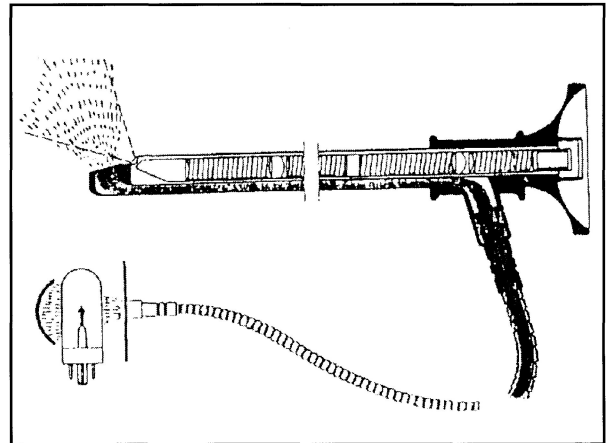
Hans Frangenheim (b. 1920), son of a professor of surgery in Cologne, was fortunate enough to spend the first years of National Socialist rule outside Germany. At age eleven, his parents sent him to a Swiss boarding school, where he stayed until 1938.<sup>13</sup> Before he took up medical studies in 1942 at the university in Munster, he did military and labor service training with the German air force. After the war, Frangenheim worked in an American military hospital. In 1946, he moved to a German university clinic for surgery. Four years later he started his training in gynecology at a women's clinic in Wuppertal.

In 1951, an internist at the Wuppertal Clinic happened to notice a tumor in the lower abdomen of a female patient during a liver laparoscopy and called in Frangenheim for assistance. As Frangenheim recalls, "I realized that this could mean a new aid for gynecology and I began to look into the literature."<sup>15</sup> He started to modify laparoscopic instruments to accomplish gynecological tasks, and a year later was performing laparoscopic examinations on a regular basis. He could not find any reports on endoscopy in gynecology except for culdoscopy. "At that time I did not have any idea of Palmer and I relied completely on Kalk's work," notes Frangenheim (Figure 4).<sup>14</sup>

In contrast to many of his colleagues, Frangenheim was not satisfied with culdoscopy and turned to an abdominal approach. He soon came across Palmer's articles on sterility and coelioscopy in the French medical press. As Palmer's guest book in Paris indicates, Frangenheim paid



**Figure 5. A prototype of Frangenheim's Insufflator (1959).**  
(Figure 5-3 in *Highlights in the History of Laparoscopy*.)



**Figure 6. The "cold light" principle.** (Figure 5-5 in *Highlights in the History of Laparoscopy*.)

his first visit in October 1955 -- the beginning of a life-long cooperation and friendship between the Palmers and Frangenheim.<sup>16</sup>

Within two and a half years, Frangenheim had performed over 350 endoscopic examinations. His first article for the medical press appeared in 1958 and included a summary of the spread of endoscopy in Europe.<sup>17</sup> "Following Decker's recommendations, the university clinics for gynecology in Hamburg, Leipzig, Kiel, and Heidelberg ... have given almost unanimous endorsement to the culdoscopy ... for the endoscopic examination of the abdominal cavity," he wrote. Frangenheim noted that only Palmer in Paris, Guggisberg in Bern, and Schwalm in Mainz had used laparoscopy. He left open the issue whether culdoscopy or laparoscopy was to be the method of choice for gynecology.

### Frangenheim's Insufflator

In the late 1950s, internists were still using atmospheric air injected via a needle to insufflate the stomach cavity. Two hundred or 500 cc of air was employed to provide pneumoperitoneum. Frangenheim recognized the need to improve this technique and decided to build an insufflator. He presented a prototype of his device in 1959: "Until recently, we had introduced CO<sub>2</sub> into the stomach cavity with an anesthetic device from the Draeger-Werke, and turned on a simple blood-pressure apparatus .... At our request, the Draeger-Werke constructed a simple, handy device to replace this makeshift one; a built-in safety valve avoids any insufflation with a pressure of over 250 mm Hg."<sup>18</sup> Despite such precautions, Frangenheim recommended that the gas pressure in the stomach cavity "per findings by Decker and Palmer, was not to exceed 30-40 mm Hg ... otherwise irritations to the peritoneum arise" (Figure 5).

Frangenheim's teaching and publication activities spread his name, even though he was not based at a university. A steady stream of gynecologists, especially from German speaking countries, poured into Wuppertal. Frangenheim recalls, "The traffic in the clinic was so heavy that there was little time for anything else, especially since the only method back then of passing on endoscopic technique was one-on-one teaching."<sup>14</sup> In the German medical press of the time we find numerous articles promoting laparoscopy.<sup>19,20</sup>

### The First Book on Gynecological Endoscopy

In the late 1950s, Frangenheim recognized the need for a book devoted entirely to laparoscopy, a project that Raoul Palmer had surprisingly not undertaken. Frangenheim's work appeared in 1959, the first book about methods of endoscopic examination in gynecology.<sup>18</sup> There Frangenheim explained why he preferred laparoscopic examination: "It provides the best diagnostic results," he wrote. "In our opinion, the second best endoscopic method is the culdoscopy in the lithotomy position... [and] we have abandoned the knee-shoulder position in culdoscopy almost completely," he remarked. At the center of Frangenheim's efforts stood the sterility issue, whereby primary and secondary sterility appeared with about the same frequency. Second place was occupied by the questionable ectopic pregnancy.

### "Cold-light"

A key breakthrough in endoscopic technique, the invention of so-called "cold light," was made around this time. A flexible bundle of glass fibers transmitted light from an outside source to the tip of an endoscope. The development was gradually introduced into the various branches of endoscopy. In the early 1960s, a German manufacturer introduced it into laparoscopy.<sup>14</sup> Frangenheim was offered the opportunity to test the cold light system, which he did and followed it up with a publication on this test (**Figure 6**). He announced his experiences with cold light at a congress in Palermo in 1964 and one year later in the German medical press. He stated that the light intensity was four to five times greater than with previous equipment and enthusiastically proclaimed that this kind of illumination belonged to the future of laparoscopy. The succeeding years were to bear out the truth of his words.<sup>21</sup>

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