



## Case Report

# Permanent colostomy wound: Aeromedical disposal

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## ABSTRACT

**Background:** A 41-year-old test pilot from the fighter stream presented to the Institute of Aerospace Medicine (IAM) with carcinoma lower one-third of rectum (opted) and a history of 2 years of follow-up post-surgery. He was physically fit with a healthy stoma in the left iliac fossa region. There was no history of local recurrence or distance metastases of colorectal cancer (CRC). During his evaluation at IAM, the officer had completed the OPTRAM profile with a stomal guard in place and could do AGSM effectively. Considering the overall prognosis, which was found to be favorable, the pilot was recommended an upgradation to a restricted flying category in the type, subject to a 1 time waiver from Director General Medical Services (air).

**Discussion:** According to the Indian Council of Medical Research consensus document for the management of CRC 2014, the annual incidence rate of colon cancer and rectal cancer in Indian male population is 4.4 and 4.1/100,000, respectively. Surgery is the primary treatment for such cancers and they are mostly curative. Multimodal therapy with neoadjuvant chemotherapy and radiotherapy is done to improve the survival rates. Latest reports published by the National Comprehensive Cancer Network for Rectal Cancer, Version 2.2018, Clinical Practice Guidelines in Oncology indicate that the peak mortality rates are currently down by 50% due to better treatment modalities. Depending on the site of primary tumor, the surgery might leave the patient with either a temporary or a permanent colostomy wound.

**Conclusion:** There was no available record/published case report of any pilot being returned to the cockpit in military flying with a permanent stoma. This case was a first of its kind with respect to aeromedical decision-making. With mortality rates decreasing due to effective treatment for cancer, aeromedical decision in more such cases may be required in the future. This case will serve as a precedence in effectively returning trained aviators to the cockpit.

**Keywords:** Rectal carcinoma, Permanent colostomy, Military aircrew, Test pilot, Aeromedical evaluation

## INTRODUCTION

According to the Indian Council of Medical Research (ICMR) consensus document for the management of CRC 2014, the annual incidence rate of colon cancer and rectal cancer in Indian male population is 4.4 and 4.1/100,000, respectively.<sup>[1]</sup> Surgery is the primary treatment for such cancers and they are mostly curative. Multimodal therapy with neoadjuvant chemotherapy and radiotherapy is done to improve the survival rates. The latest reports published by the National Comprehensive Cancer Network for Rectal Cancer, Version 2.2018, Clinical Practice Guidelines in Oncology indicate that the total mortality rate is currently down by 50% due to better treatment modalities.<sup>[2]</sup> Depending on the site of primary tumor, the surgery might leave the patient with either a temporary or permanent colostomy wound. Increasingly people

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are getting their lives back after permanent colostomy and are involved in high-risk jobs such as firefighting, policing, surfing, and contact sports such as professional boxing and flying. In December 2018, a test pilot of the Indian air force reported to the Institute of Aerospace Medicine (IAM) for aeromedical evaluation post-multimodal treatment for lower one-third of rectum with a permanent colostomy.

## CASE REPORT

This 41-year-old pilot from the fighter stream in January 2016 reported with bleeding per rectum. The officer had complaints of intermittent episodes of bleeding per rectum which did not respond to symptomatic medication. In March 2016, the officer underwent a colonoscopy which revealed an ulceroproliferative lesion <2 cm inside the anal verge and extending 8 cm in the rectum. Tissue specimen taken for histopathology revealed moderately differentiated adenocarcinoma. Positron emission tomography (PET) scan done in March 2016 confirmed the diagnosis. The pilot underwent neoadjuvant concurrent chemoradiotherapy starting March 22, 2016. It consisted of 28 days of 50.40 gray external beam radiotherapy pelvis exposure with two cycles of chemotherapy (5 fluorouracil with injection leucovorin). This concluded by April 28, 2016. On June 28, 2016, abdominoperineal resection with descending colostomy was carried out. The post-operative period was uneventful and the pilot recovered well. Post-surgery period was followed by adjuvant chemotherapy 6 + 6 cycles of folinic acid, fluorouracil, and oxaliplatin-4 (oxaliplatin + leucovorin + folinic acid + fluorouracil) from August 4, 2016, to February 28, 2017. Thereafter, the pilot was under observation for recurrence and metastasis. During follow-up, a non-fluoro-D-glucose (FDG)-avid nodule in Rt lower lung was seen which was investigated with contrast-enhanced computed tomography in May 2017 and September 2017 and PET scan in October 2017 and August 2018. The lesion remained non-FDG-avid and hence was considered benign. As per the IAP 4303 (4<sup>th</sup> ed.), the officer had completed 2 years in non-flying category since the initial diagnosis and was still advised regular follow-up; hence, he was opined a permanent non-flying status.

The officer had maintained a rigorous exercise regime post-surgery and appealed against the permanent non-flying status. His case was considered and required administrative approval of return to flying status was given. The officer was then sent to IAM for aeromedical evaluation.

## DISCUSSION

For evaluation of return to flying status, the following were considered:

1. The officer was asymptomatic post-completion of adjuvant chemotherapy since February 28, 2017
2. The officer was not on any kind of medication
3. Regular follow-up of the officer for recurrence and distance metastases had not shown any relapse
4. The officer was healthy and carried out colostomy irrigation every morning for 60–90 min
5. After completion of colostomy irrigation, the site remained dry throughout the day
6. The officer carried on with his daily activities throughout the day with small amount of cotton and surgical tape over the stoma site
7. The officer had no difficulty in donning his uniform and wearing it throughout the day
8. At no point of time was it observed that the uniform was soiled due to his colostomy
9. For the past 1½ years, the officer had been active physically and socially
10. The officer was able to carry out weight training (lift 60 kg weights) 6 days a week and run 3 km almost everyday and perform squats
11. He also traveled comfortably in civil and military aircrafts as a passenger
12. He did not suffer from any late complication of colostomy surgery such as hernia and obstruction, and there was no record of secondary infection of the colostomy site post-surgery

Permanent colostomy is an artificial opening made in the abdominal wall for the colon to divert feces and flatus outside the abdomen where they can be collected in an external device.<sup>[3]</sup> Earlier such patients required a lot of medical and psychological support. Due to increase in number of colostomy resulting from rising number of perineal injuries, increasing incidence of CRC and inflammatory bowel disease, there has been a lot of development in the field of management of colostomy. A range of products is available for support and care and stoma and they allow the colostomies to lead a productive and healthy life. Concerns regarding a colostomy are mainly regarding the long-term complications such as stomal prolapse, stomal stenosis, parastomal pyoderma gangrenosum, and parastomal hernia.<sup>[4]</sup>

Existing guidelines for reflighting a pilot with permanent colostomy are as follows:

1. USAF waiver guidelines updated in January 2018 state that the presence of colostomy or ileostomy is not compatible with military aviation.<sup>[5]</sup>
2. FAA guidelines for aviation medical examiners (2017) state that applicant with ileostomy or colostomy may be considered if he or she has fully recovered from surgery and is asymptomatic.<sup>[6]</sup>
3. Royal air force manual for the assessment of medical fitness AP 1269A (third edition, date of Publication 1/8/2016, page 454 para 5c) states that those with

permanent stoma are to be graded A3 and unfit ejection seat aircraft and E3, i.e., unfit service outside base area. Their continued fitness to fly in other aircrafts will be decided by the supervising consultant and the PMB.<sup>[7]</sup>

4. Australian Government Civil Aviation Safety Authorities designated aviation medical examiners handbook September 2011 state that the great majority of applicants with a stoma will not be restricted on the basis of the stoma.<sup>[8]</sup>

**Aeromedical concerns**

**Recurrence/metastasis**

Recertification after the treatment of malignant disease is calculated by an internationally accepted formula.<sup>[9,10]</sup>

Risk of recurrence in the certifying year X risk of type of metastasis most likely to cause incapacitation X weighting factor Table 1.

Annual recurrence rate of CRC was not available directly for Indian population, hence, was calculated from the survival rates. According to the consensus document of ICMR<sup>[11,11]</sup> at the 2<sup>nd</sup>-3<sup>rd</sup> years, the survival rate was 0.9/90%. Hence, the risk of recurrence was 10%.

In case of CRC, the liver is the predominant site of metastasis in most patients (7.7%), there are few studies which also indicate a high risk of pulmonary metastasis (11.4%).<sup>[12-15]</sup> The brain was the least common site of recurrence with a recurrence rate of 0.5% Table 2.

**Table 1:** Possible sites and incapacitation risk weighting in case of colorectal cancer.

| Site        | Incapacitation risk weighting as % |
|-------------|------------------------------------|
| Local       | 5                                  |
| Lymph nodes | 5                                  |
| Liver       | 5                                  |
| Lung        | 5                                  |
| Bone        | 5                                  |
| Bone marrow | 20                                 |
| Brain       | 100                                |

The weighting factors were considered as per Ernsting's textbook of aerospace medicine.<sup>[9]</sup>

**Table 2:** Possible sites and recurrence rate of colorectal cancer.

| Sites                     | Recurrence rate (%) |
|---------------------------|---------------------|
| Lung                      | 11.4                |
| Liver                     | 7.7                 |
| Bone                      | 3.2                 |
| Extraregional lymph nodes | 1.7                 |
| Peritoneum                | 1.5                 |
| Brain                     | 0.5                 |

As per the above data, the risk of inflight incapacitation due to recurrence/relapse of CRC was calculated as follows:

$$10/100 \times 11.4/100 \times 5/100 = 0.057\% \text{ for lung metastases.}$$

$$10/100 \times 0.5/100 \times 100/100 = 0.05\% \text{ for brain metastases.}$$

Since it was well below 1% acceptable risk criteria, it was considered inconsequential. The direct recurrence and metastasis were unlikely to cause any overt incapacitation. Any recurrence/relapse would be detected during routine follow-up; much before it became a flight safety concern.

**Sudden incapacitation due to stomal complications**

The cumulative probability of complication due to colostomy in the 3<sup>rd</sup> year was 30%.<sup>[16]</sup> The crude rate of most common colostomy complication, i.e., parastomal hernia was 21.2%.<sup>[4]</sup> Considering a weighting factor of 5%, i.e., same as that for liver metastasis, the total risk due to colostomy complications was calculated to be 0.003% (much below the acceptable annual risk of 1%).

**Ability to cope up in the aviation environment**

1. Interference with flying clothing. The officer had no problem in donning and doffing flying overalls and anti-G suit and keeping it on for prolonged time.
2. Interference with harness system. The officer had no problem sitting strapped inside the cockpit with the 5-point harness system.
3. Effect of high G environment. The officer sustained 4.5 Gz target tracking for 60 s, 6 Gz target tracking for 30 s, 7 Gz target tracking for 15 s, 8 Gz target tracking for 10 s, and 9 Gz target tracking for 5 s without any discomfort while wearing a stoma guard under the anti-G suit and performing anti-G straining maneuver in the high-performance human centrifuge.
4. Vibration stress. The officer tolerated the vibration stress well. The vibration profile on the multiaxial vibration chair was suitably modified to provide frequencies which cause resonance of abdominal viscera. After 25 min exposure to the vibration profile, there was no discharge from the colostomy site.
5. Pressure changes. The changes in ambient pressure at the rate of 3000 feet/min from ground to 10,000 feet were simulated in the explosive decompression chamber. Both during ascent and descent at the simulated rate, there was no discharge from the colostomy site.
6. Effect of ejection forces on colostomy. Since this was one of its kind opinion, there were no data on effect of ejection forces on colostomy. However, return to contact sports is well documented in colostomy patients. In this case, the stoma would be guarded by a stomal guard and the inflated abdominal bladder of the anti-G suit.

The pilot had tolerated the OPTRAM profile for high G without any discomfort. In view of this, it was considered unlikely that instantaneous peak +Gz would adversely affect the colostomy.

Although not related to aeromedical considerations, social acceptability was also a concern. The officer had trained his bowels for evacuation in 24 h by irrigating the colostomy every morning. This procedure kept the colostomy dry for the next 24 h. The officer was able to wear uniform and overall without any difficulty. If someone was not aware of his colostomy status, the person would never come to know about it just by looking at him in the normal course of the day. He had been working for the past 1½ years and had been socially active. The colostomy had not caused any discomfort to coworkers at his workplace or stress during social gatherings.

After a careful evaluation under all aviation stressors and taking into account the global precedence, the overall prognosis was found to be favorable in this case. He was opined to be fit and upgraded to a restricted flying category with 1 time waiver from Director General Medical Services (air).

During his evaluation at IAM, the officer had completed the OPTRAM profile with a stomal guard in place. He was able to effectively do anti-G straining maneuver, he was able to sustain the pressure of an inflated anti-G suit over his flying overall during all the runs carried out in the high-performance human centrifuge. Post the centrifuge run, there was no increase in ooze from the stomal site nor was the officer symptomatic. IAM recommendation was to upgrade him to a restricted flying category in the fighter stream and request for an executive report in trainer aircraft under operational flying conditions. It was also requested that the pilot during his sortie is to be observed by a qualified and experienced pilot and assess the condition of the stoma under actual aeromedical stressors.

## CONCLUSION

During the detailed aeromedical evaluation done at IAM, extensive search for global precedence was done. There was no available record/published case report of any pilot being returned to the cockpit in military flying with a permanent stoma. Hence, this case is a first of its kind with respect to aeromedical decision-making. All the evaluations done including vibration stress and pressure changes were suitably modified to test this case. With mortality rates decreasing due to effective treatment for cancer, aeromedical decision in more such cases may be required in the future. This case will serve as a precedence in effectively returning trained aviators to the cockpit.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms.

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## Conflicts of interest

There are no conflicts of interest.

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