

SECONDARY PREVENTION OF COLORECTAL CANCER

Tereza Dušíčková *, Sylva Bártlová

University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, Institute of Nursing, Midwifery and Emergency Care, České Budějovice, Czech Republic

Submitted: 2019-05-23

Accepted: 2019-06-06

Published online: 2019-12-31

Abstract

Goal: The goal of this review study is to map the options of secondary prevention of colorectal cancer.

Methods: We used the method of document content analysis. We searched for references using the following keywords: “screening”, “colorectal cancer”, “occult bleeding”, “colonoscopy”, and the Boole operators “AND” and “NOT”. We used the databases of EBSCO, ProQuest and Pubmed between February and April 2019. After the filtering, we included 20 sources.

Results: The study shows that if colorectal cancer is treated in the early phase, there is a higher probability of survival. We also confirmed a decreased incidence and mortality using the screening of risk groups. The colorectal carcinoma screening is carried out by testing the stool or colonoscopy. To test the stool, we can use haemoccult (gFOBT), immunochemical techniques (FIT) or DNA mutation testing in the stool.

Conclusion: There is not a unanimous recommendation for colorectal carcinoma screening. Some countries have state regulations. This research shows that there is not sufficient proof for using haemoccult tests or immunochemical techniques.

Keywords: *Colorectal tumour; Diagnostics; Nurse; Screening; Secondary prevention*

INTRODUCTION

Colorectal cancer (CRC) is a glandular, malignant tumour that grows from the large intestine and colon cells (Bortlík, 2005). The process of malignancy is caused by the increasing accumulation of genetic changes, which are a consequence of uncontrolled cell growth. Genome instability is a basic condition for the occurrence of tumour (Suchánek et al., 2011). The CRC precancerosis is created by polyps (Adam et al., 2004). Globally, the Czech Republic is in fifth place regarding the incidence of CRC – behind Slovakia, Hungary, New Zealand and Israel (Epidemiology of malignant tumours in the Czech Republic, 2018).

The above-mentioned information shows the necessity of the prevention of CRC. Today, all kinds of prevention of this illness are used. The goal of primary prevention is the decrease in the incidence of this illness (Zikán and Cibula, 2009). Primary prevention includes correct regimen – a decrease in excessive weight, a decrease in alcohol and nicotine intake, an increase in fibre intake etc. (Schneiderová, 2014). Holubec et al. (2004) recommend sufficient calcium, vitamins A, C, E and selenium intake through food, and the correct food preparation regarding thermal conditions. Primary prevention partially solves the CRC issue, as well as genetic predispositions and the digestive system illnesses – idiopathic inflammations of

intestines, familial polyposis syndrome etc. (Schneiderová, 2014).

Secondary prevention focuses on the early detection of the disease and early stadia. Its goal is to improve long-term treatment results (Zikán and Cibula, 2009). Due to high incidence, the Czech Republic founded the National Programme for the Screening of Colorectal Carcinoma (Suchánek et al., 2017). We can test the stool or use endoscopic or radiologic examination (Zavoral et al., 2016). The advanced phase of the tumour is psychologically, physically and financially demanding – and these procedures can lead to a decrease in the number of these illnesses (Fraňková and Synytsya, 2017). The goal of tertiary prevention is to prevent possible relapses of tumour (Skála, 2018), while the goal of quaternary prevention is to improve the quality of life of patients in the advanced phase of the illness (Janíková and Zeleníková, 2013).

MATERIALS AND METHODS

This article is a review study. We used the method of content analysis of documents that

were published in the scientific databases of EBSCO, ProQuest and Pubmed. We searched for references using the following keywords: “screening”, “colorectal cancer”, “occult bleeding”, “colonoscopy”, and the Boole operators “AND” and “NOT”. We also reduced the number of publications by the year (2008–2019).

At first, we found 568 results. After filtering, we had 145 sources. In the EBSCO database, we found 87 sources; 23 in ProQuest and 35 in Pubmed. In the next phase, we excluded all duplicates and unrelated materials, publications that were unavailable in full text and qualification works. We selected those that mapped the issue of secondary screening of colorectal tumour the most. The final number of sources was 20 (Chart 1). The collection and the analysis of data were carried out between February and April 2019.

RESULTS AND DISCUSSION

In general, we can say that screening is a regular preventative examination of a certain group of people who do not show symptoms of the discussed illness and are not at high

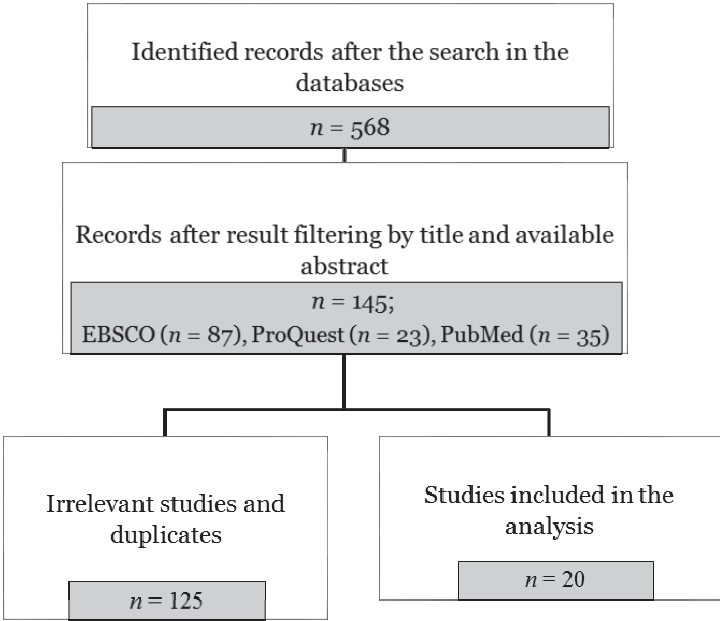


Chart 1 – PRISMA diagram (illustration of the methodology of publication selection)

risk of the occurrence of this illness (Šachlová and Májek, 2015). The research shows that if a colorectal tumour is treated early, patients are more likely to survive (US Preventive Services Task Force et al., 2016; Wang et al., 2019). Studies also confirm a decreased incidence and mortality due to the screening of risk groups (Spáčilová et al., 2018; Wang et al., 2019; Zorzi et al., 2015). For this reason and a high incidence of colorectal tumour, the National Colorectal Cancer Screening Programme was founded in 2009 in the Czech Republic (Suchánek et al., 2017). This programme is supported by regulation No. 317/2016 Coll. (on preventative check-ups), which regulates colorectal cancer screening preventions. The regulation entitles every person to preventative check-ups by a GP once in two years. The doctor should also carry out an oncological examination (Zikán and Cibula, 2009). Screening is also convenient because of the incidence of sporadic colorectal tumour, when the tumour can grow for between 8 and 10 years. Screening can be carried out in two ways. The first is testing the stool and the other is the endoscopic or radiological intestine examination (Zavoral et al., 2016).

Used screening methods

Screening of colorectal tumour is carried out by testing the stool and by colonoscopic examination. The stool can be tested by guaiac tests (gFOBT/guaiac faecal occult blood test), immunochemical tests (FIT/faecal immunochemical test) or the testing of DNA mutations in the stool (Seifert et al., 2014). Suchánek et al. (2017) state that the Czech Republic uses immunochemical tests, which are followed by colonoscopy if the results are positive, and also screening colonoscopy. The occult blood test can be recommended by a GP or gynaecologist to asymptomatic patients who are not at a high risk of colorectal tumour—from the age of 50. If the results of the occult blood test are negative in people between 50 and 54, another testing is carried out once a year or once in two years in people older than 55 (Falt et al., 2016).

The gFOBT test is recommended because it is not expensive, simple, and patients can carry it out alone and have it assessed by a doctor (Seifert et al., 2014). Manipulation with the stool and the necessity of dietary restrictions is uncomfortable for respondents

(Deutekom, 2010; Hoffman et al., 2010). Seifert et al. (2014) point out the impossibility of automatic subtraction and setting haemoglobin concentration when a sample is positive. A gFOBT diagnoses the occult bleeding based on haemoglobin colourings (porphyrins) (Chrastina, 2009), while the FIT test diagnoses the occult bleeding based on the reaction of the test antibody and human haemoglobin (Seifert et al., 2014).

A number of studies focus on the comparison of immunochemical to haemoccult tests (Chiu et al., 2015; Deutekom, 2010; Hoffman et al., 2010; Shapiro et al., 2017). Hoffman et al. (2010) carried out a study on veteran men. The sample group was divided by screening tests (gFOBT and FIT). The research shows that the patients who took both tests preferred screening using the FIT method. Due to the simplicity of testing preparations (the simple way of obtaining stool, the need of two samples), dietary and medical limitations are not necessary. The research of Chiu et al. (2015) is also associated with this fact. They also studied the suitability of the used screening method. 62% of their sample group preferred FIT, 12% preferred gFOBT and 26% were neutral. The largest problems were dietary and medical limitations and complex stool sampling using gFOBT. Deutekom (2010) also found out that 32% of the respondents stated the negative emotions they experienced during sampling (disgust, shame). The researchers state that the level of participation was higher in patients who were given the examination set using FIT ($p < 0.001$) when compared to both methods. Hol et al. (2010) also proved a higher level of participation of patients in screenings using FIT. Birkenfeld et al. (2011) studied the influence of socioeconomic status on testing using gFOBT and FIT. They found that the testing had been influenced by the respondents' age, gender and immigration. For this reason, they suggested the education of patients regarding this issue—with the focus on sociodemographic parameters. Roslani et al. (2012) compared the validity and suitability of gFOBT and FIT or the combination of the two methods without the previous dietary limitation in 103 Asian respondents. They found out that the sensitivity for detecting any sort of neoplasia using FIT is 53%, 40% using gFOBT and 23.3% when both methods are combined. The results also show that FIT is the recom-

mended method if dietary restrictions are not suitable for patients – particularly due to a relatively low level of false positivity, and a higher level of sensitivity and specificity. Immunochemical tests are also seen as more reliable due to a higher level of sensitivity (Brenner and Thao, 2009; Chiu et al., 2015; Roslani et al., 2012; Segnan, et al., 2010; Shapiro et al., 2017) and specificity (Brenner and Thao, 2009; Roslani et al., 2012; Segnan, et al., 2010). They are also better perceived by soci-

ety (Birkenfeld et al., 2011; Deutekom, 2010). Due to these facts, there are a larger number of colorectal neoplasms that can be detected (Brenner and Thao, 2009).

For screening, we can also use DNA mutation. Symonds et al. (2015) compared the suitability of blood tests for stool sampling using FIT. They found out that the number of participants increased with the possibility of blood tests. The research shows that blood tests can be a convenient additional tool in

Table 1 – Results summary

Research team	Results
US Preventive Services Task et al., 2016; Wang et al., 2019	The initial phase of tumour treatment increases the probability of survival.
Spáčilová et al., 2018; Wang et al., 2019; Zorzi et al., 2015	The decrease in the incidence and mortality due to the screening of risk groups.
Hoffman et al., 2010	After comparing the gFOBT and FIT tests, patients prefer screening using FIT, because it is not necessary to keep dietary or medical measures and stool sampling is easier.
Shapiro et al., 2017	The comparison of the gFOBT and FIT tests; the results show that FIT is more sensitive than gFOBT.
Deutekom, 2010	After the comparison of the gFOBT and FIT tests, there was a higher number of sampling in patients who received the FIT examination set. The results also show the respondents' negative reactions, such as embarrassment due to stool sampling.
Chiu et al., 2015	Comparing gFOBT and FIT – the greatest problems were dietary or medical limitations and difficulties in sampling using gFOBT.
Hol et al., 2010	After comparing the gFOBT and FIT tests, there was a higher number of sampling in patients who received the FIT examination set.
Birkenfeld et al., 2011	Finding out the influence of socioeconomic status on testing using gFOBT and FIT. The testing was influenced by the respondents' age, gender and immigration.
Roslani et al., 2012	After comparing the gFOBT and FIT tests, the sensitivity for neoplasia using FIT was 53%, using gFOBT it was 40%, and using the combination of the two it was 23.3%.
Brenner and Thao, 2009; Segnan et al., 2010	Immunochemical tests are more specific and sensitive.
Birkenfeld et al., 2011	FIT is socially better accepted.
Symonds et al., 2015	The increase in the number of participants in the screening of colorectal tumour using blood tests.
Imperiale et al., 2014	Testing stool DNA showed significantly more tumours than FIT but there were more falsely positive results.
Bretthauer et al., 2016	A high level of tumour detection using colonoscopy.
Quintero et al., 2012	Proving higher participation in screening using FIT than using colonoscopy.
Quintero et al., 2014	Annual immunochemical test repeated for three years is a suitable substitute for colonoscopy.
Pioche et al., 2018	It is not good to use capsule endoscopy or colonoscopy using computed tomography in patients with positive gFOBT.

screening colorectal tumour. Similar research was carried out by Imperiale et al. (2014), who studied DNA mutations in the stool of asymptomatic people. The stool DNA testing showed significantly more tumour than the FIT method, but also more falsely positive results.

Falt et al. (2016) state that colonoscopy by screening is used in asymptomatic people who are not included in high-risk groups. It is carried out at specialized workplaces and its advantage is that it can be repeated once in ten years (in case of negative colorectal neoplasia). Colonoscopy is also good for its high level of tumour detection (Bretthauer et al., 2016). Clinical practice wonders as to which screening tool is better. Quintero et al. (2012) found out that the number of participants is higher when the FIT method is used compared to colonoscopy. Quintero et al. (2014) also found that the immunochemical tests (repeated annually every three years) are a suitable substitute for colonoscopy. The alternative to colonoscopy, which is especially used in foreign countries, is capsule endoscopy or colonoscopy using computed tomography. The results of the study of Pioche et al. (2018) show that these methods are not suitable for patients with positive gFOBT (Table 1).

CONCLUSIONS

Currently, there is not one manual for screening colorectal tumour, but some countries have established state measures. Scientific experts agree that there is no sufficient evidence for the use of haemoccult or immunochemical tests. Nevertheless, there are advantages to the FIT test compared to gFOBT. FIT is more tolerated by patients (there is no need for dietary restrictions, easier sampling) and it offers the possibility of numeric results. However, when compared to colonoscopy, FIT is less sensitive to the detection of advanced colorectal neoplasia.

Conflict of interests

The authors have no conflicts of interests to declare.

Acknowledgement

This article is related to the research grant project No. 048/2015/S “Use of conceptual models in clinical and community practice”, which is financially supported by the Grant Agency of the University of South Bohemia in České Budějovice.

REFERENCES

1. Adam Z, Vorlíček J, Vaníček J, et al. (2004). Diagnostické a léčebné postupy u maligních chorob [Diagnostic and therapeutic procedures for malignant diseases]. Praha: Grada (Czech).
2. Birkenfeld S, Belfer RG, Chared M, Vilkin A, Barchana M, Lifshitz I, et al. (2011). Factors affecting compliance in faecal occult blood testing: a cluster randomized study of the faecal immunochemical test versus the guaiac faecal occult test. *J Med Screen* 18(3): 135–141. DOI: 10.1258/jms.2011.010147.
3. Bortlík M (2005). Kolorektální karcinom [Colorectal tumour]. In: Lukáš K et al. (Eds). *Gastroenterologie a hepatologie pro zdravotní sestry* [Gastroenterology and hepatology for nurses]. Praha: Grada, pp. 195–202 (Czech).
4. Brenner H, Tao S (2009). Superior diagnostic performance of faecal immunochemical tests for haemoglobin in a head to head comparison with guaiac based faecal occult blood tests among 2235 participants of screening colonoscopy. *Eur J Cancer* 49(14): 3049–3054. DOI: 10.1016/j.ejca.2013.04.023.
5. Bretthauer M, Kaminski MF, Løberg M, Zauber AG, Regula J, Kuipers EJ, et al. (2016). Population-Based Colonoscopy Screening for Colorectal Cancer: A Randomized Clinical Trial. *JAMA Intern Med* 176(7): 894–902. DOI: 10.1001/jamainternmed.2016.0960.
6. Chiu HM, Chiu HM, Chang LC, Hsu WF, Chou CK, Wu MS (2015). Non-invasive screening for colorectal cancer in Asia. *Best Pract Clin Gastroenterol* 29(6): 953–965. DOI: 10.1016/j.bpg.2015.09.015.
7. Chrástina J (2009). Principy testů určených k detekci okultního krvácení do stolice a jejich charakteristika [Principles of tests to detect faecal occult blood and their characteristics]. *Interní med* 11(4): 193–196 (Czech).

8. Deutekom M (2010). Comparison of guaiac and immunological fecal occult blood tests in colorectal cancer screening: the patient perspective. *Scand J Gastroenterol* 45(11): 1345–1349. DOI: 10.3109/00365521.2010.497937.
9. Epidemiologie zhoubných nádorů v České republice [Epidemiology of malignant tumours in the Czech Republic] (2018). [online] [cit. 2019-04-22]. Available from: <http://www.svod.cz/> (Czech).
10. Falt P, Urban O, Suchánek Š, Cyrany J, Bortlík M, Martínek J, et al. (2016). Doporučené postupy České gastroenterologické společnosti ČLS JEP pro diagnostickou a terapeutickou koloskopii [Recommended procedures of the Czech Gastroenterology Society of ČLS JEP for diagnostic and therapeutic colonoscopy]. *Gastroenterologie a hepatologie* 70(6): 523–538. DOI: 10.14735/Åamgh2016csgh.info (Czech).
11. Fraňková S, Synytsya A (2017). Metody diagnózy nádorových onemocnění plic a tlustého střeva [Methods of diagnosis of lung and colon cancer]. *Chemické listy* 111(8): 502–508 (Czech).
12. Hoffman RM, Steel S, Yee EF, Massie L, Schrader RM, Murata GH (2010). Colorectal cancer screening adherence is higher with fecal immunochemical tests than guaiac-based fecal occult blood tests: a randomized, controlled trial. *Prev Med* 50(5–6): 297–299. DOI: 10.1016/j.ypmed.2010.03.010.
13. Hol L, van Leerdam ME, van Ballegooijen M, van Vuuren AJ, van Dekken H, Reijerink JC (2010). Screening for colorectal cancer: randomised trial comparing guaiac-based and immunochemical faecal occult blood testing and flexible sigmoidoscopy. *Gut* 59(1): 62–68. DOI: 10.1136/gut.2009.177089.
14. Holubec L, et al. (2004). Kolorektální karcinom: současné možnosti diagnostiky a léčby [Colorectal carcinoma: current options in diagnosis and treatment]. Praha: Grada (Czech).
15. Imperiale TF, Ranshoff DF, Itkowitz SH, Levin TR, Lavin P, Lidgard GP, et al. (2014). Multitarget stool DNA testing for colorectal-cancer screening. *N Engl J Med* 370: 1287–1297. DOI: 10.1056/NEJMoa1311194.
16. Janíková E, Zeleníková R (2013). Ošetrovatelská péče v chirurgii [Nursing care in surgery]. Praha: Grada (Czech).
17. Pioche M, Ganne C, Gincul R, De Leusse A, Marsot J, Balique J, et al. (2018). Colon capsule versus computed tomography colonography for colorectal cancer screening in patients with positive fecal occult blood test who refuse colonoscopy: a randomized trial. *Endoscopy* 50(8): 761–769. DOI: 10.1055/s-0044-100721.
18. Quintero E, Carrillo M, Gimeno-García AZ, Hernández-Guerra M, Nicolás-Pérez D, Alonso-Abreu I, et al. (2014). Equivalency of fecal immunochemical tests and colonoscopy in familial colorectal cancer screening. *Gastroenterology* 147(5): 1021–1030. DOI: 10.1053/j.gastro.2014.08.004.
19. Quintero E, Castells A, Bujanda L, Cubiella J, Salas D, Lanas Á, et al. (2012). Colonoscopy versus fecal immunochemical testing in colorectal-cancer screening. *N Engl J Med* 366(8): 697–706. DOI: 10.1056/NEJMoa1108895.
20. Roslani AC, Abdullah T, Arumugam K (2012). Screening for colorectal neoplasias with fecal occult blood tests: false-positive impact of non-dietary restriction. *Asian Pac J Cancer Prev* 13(1): 237–241. DOI: 10.7314/apjcp.2012.13.1.237.
21. Šachlová M, Májek O (2015). Screening kolorektálního karcinomu [Colorectal cancer screening]. *Onkologie* 9(4): 162–166 (Czech).
22. Schneiderová M (2014). Perioperační péče [Perioperative care]. Praha: Grada (Czech).
23. Segnan N, Patnick J, von Karsa L (2010). European guidelines for quality assurance in colorectal cancer screening and diagnosis. Luxembourg: Publications Office of the European Union.
24. Seifert B, Májek O, Zavoral M, Král N, Suchánek S, Ngo O, Dušek L (2014). Results of the Czech National Colorectal Cancer Screening Programme – Faecal Occult Blood Tests. *Klin Onkol* 27(Suppl. 2): 87–97 (Czech).
25. Shapiro JA, Bobo JK, Church TR, Rex DK, Chovnick G, Thompson TD, et al. (2017). A comparison of fecal immunochemical and high-sensitivity guaiac tests for colorectal cancer screening. *Am J Gastroenterol* 112(11): 1728–1735. DOI: 10.1038/ajg.2017.285.
26. Skála B (2018). Prevence a screening onkologických onemocnění [Cancer prevention and screening]. Praha: Společnost všeobecného lékařství ČLS JEP (Czech).
27. Spáčilová Z, Solgajová A, Vörösová G, Zrubcová D (2018). Exogenous risk factors for colorectal cancer in people aged 50 years and older. *Kontakt* 20(2): 126–133. DOI: 10.1016/j.kontakt.2017.11.005.
28. Suchánek Š, et al. (2017). Screening kolorektálního karcinomu [Colorectal cancer screening]. In: Špičák J et al. (Eds). *Novinky v gastroenterologii a hepatologii II* [News in gastroenterology and hepatology]. Praha: Grada, pp. 15–21 (Czech).

29. Suchánek Š, Vepřeková G, Májek O, Dušek L, Zavoral M (2011). Epidemiologie, etiologie, screening a diagnostika kolorektálního karcinomu, včetně diagnosticko-terapeutických zákroků na tlustém střevě [Epidemiology, etiology, screening and diagnosis of colorectal cancer, including diagnostic-therapeutic interventions in the colon]. *Onkologie* 5(5): 261–265 (Czech).
30. Symonds EL, Pedersen S, Cole SR, Massolino J, Byrne D, Guy J, et al. (2015). Improving participation in colorectal cancer screening: a randomised controlled trial of sequential offers of faecal then blood based non-invasive tests. *Asian Pac J Cancer Prev* 16(18): 8455–8460. DOI: 10.7314/apjcp.2015.16.18.8455.
31. US Preventive Services Task Force, Bibbins-Domingo K, Grossman DC, Curry SJ, Davidson KW, Epling JW Jr, et al. (2016). Screening for Colorectal Cancer US Preventive Services Task Force Recommendation Statement. *JAMA* 315(23): 2564–2575. DOI: 10.1001/jama.2016.5989.
32. Vyhláška č. 317/2016 Sb., kterou se mění vyhláška č. 70/2012 Sb., o preventivních prohlídkách [Regulation No. 317/2016 Coll., which amends the regulation No. 70/2012 Coll. on preventative check-ups]. In: *Sbírka zákonů České republiky*, částka 124/2016, p. 4837 (Czech).
33. Wang H, Wang P, Liu X, Li L, Xiao X, Liu P, et al. (2019). Factors predicting the colorectal adenoma detection rate in colonoscopic screening of a Chinese population: A prospective study. *Medicine (Baltimore)* 98(15): e15103. DOI: 10.1097/MD.00000000000015103.
34. Zavoral M, Grega T, Suchánek Š (2016). Komplikace léčby kolorektálního karcinomu [Complications in the treatment of colorectal cancer]. *Onkologie* 10(1): 41–47 (Czech).
35. Zikán M, Cibula D (2009). Prevence a screening zhoubných nádorů [Prevention and screening of malignant tumours]. In: Cibula D, Petruželka L, et al. (Eds). *Onkogynekologie*. Praha: Grada, pp. 93–96 (Czech).
36. Zorzi M, Fedeli U, Schievano E, Bovo E, Guzzinati S, Baracco S, et al. (2015). Impact on colorectal cancer mortality of screening programmes based on the faecal immunochemical test. *Gut* 64(5): 674–690. DOI: 10.1136/gutjnl-2014-307508.

 Contact:

Tereza Dušičková, University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, Institute of Nursing, Midwifery and Emergency Care, U Výstaviště 26, 370 05 České Budějovice, Czech Republic
Email: dusictoo@zsf.jcu.cz