

Modification of Individual Diving Practices After PFO Diagnosis or PFO Closure



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Background

Patent foramen ovale (PFO) is associated with an increased incidence of decompression sickness (DCS).¹ Relative risk of divers with a PFO is 4-6x times greater than overall risk of DCS in recreational scuba divers, which is 2 in 10,000 dives or 0.02%.^{2,3}

Risk lowering strategies include no diving, more conservative diving (limiting depth and/or bottom time, utilizing oxygen-enriched breathing mixtures), and closure of PFO.³

Percutaneous closure of PFO carries a complication risk of 1-2% and may cause palpitations, bleeding, thrombosis, or device embolization.⁴

Diving practices after diagnosis of a PFO in those who undergo closure and those who opt for non-surgical management has yet to be clearly defined.

Aim

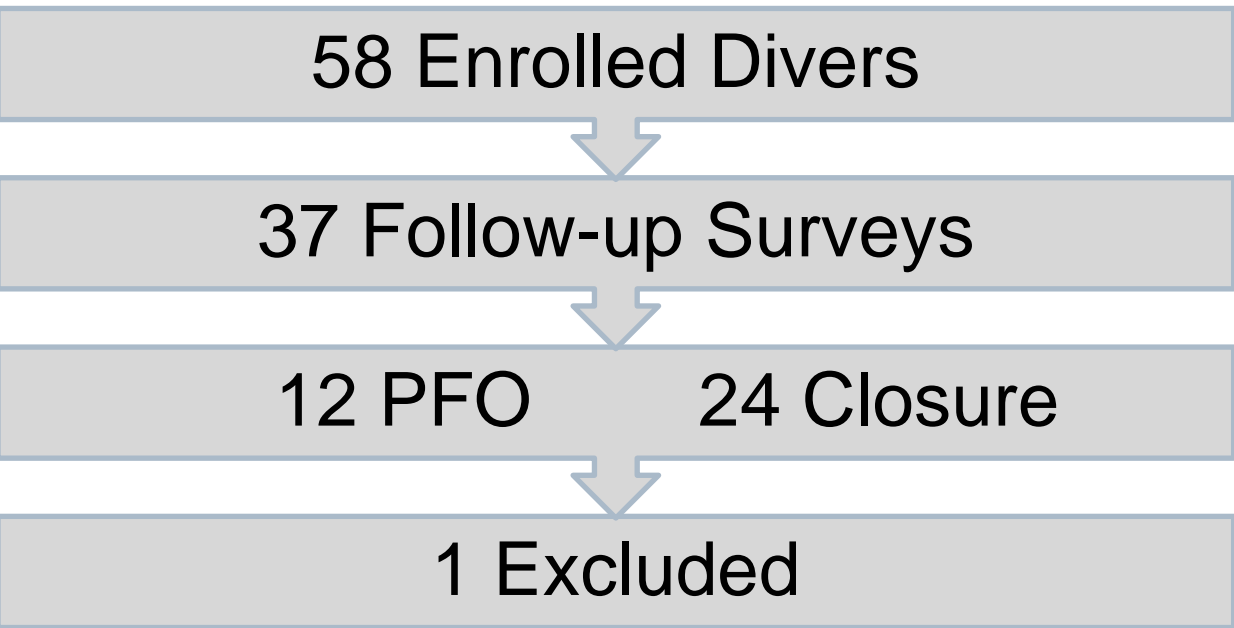
The present analysis aims to elucidate changes in diving practice by divers who are diagnosed with a PFO and choose to undergo closure and those divers diagnosed with PFO who choose non-surgical management.

Methods

In 2010, DAN initiated a study to compare the risk-benefits of PFO closure in divers. Study inclusion criteria were 18 years old or greater, certified diver, and diagnosis of PFO with medical clearance for diving.

In 2012, a follow-up survey was administered to the 58 enrolled patients. The survey inquired about number of dives, dive depths, breathing gases, possible complications of PFO closure, DCS symptoms, and general health status. The responses to the follow-up survey as summarized in Diagram 1.

Diagram 1: Responses Follow-up Survey



The mean number of annual dives before PFO diagnosis and before closure were compared to diving practices before diagnosis (PFO group) and before closure of PFO (Closure group), respectively. Data are shown as mean and standard deviation in parentheses. The difference in means between the annual number of dives in each group was tested for statistical significance via an unpaired t-test.

Results

Frequency of Diving

The mean annual number of dives for the PFO group was 45.5(35.7) before diagnosis and 32.7(30.4) after diagnosis, which was not statistically significant.

In the Closure group, the mean annual number of dives was 43.0(33.1) before diagnosis and 33.3(42.9) after closure which was not statistically significant. Table 1 summarizes this data.

Table 1. Mean (St. Dev) annual number of dives before diagnosis and after diagnosis (PFO group) and before closure and after closure (Closure Group)

Group	Before Dx or Closure	After Dx or Closure	T-test	P-Value
PFO	46(36)	33(30)	0.95	0.35
Closure	43(33)	33(43)	0.88	0.38

Table 2. Number of divers who changed their frequency of diving

Group	No diving	Less Dives	More Dives
PFO	3	6	3
Closure	8	10	6

Complications of Closure

Table 3. Mean (St. Dev) annual number of dives before and after PFO closure in divers with and without complications

Outcome of Closure	Mean (St Dev.) Before	Mean (St. Dev.) After
Complications* (n = 3)	8(4)	0(0)
No complications (n = 21)	48(32)	38(44)

* Two PFO were not fully closed. One diver reports recurrent visual symptoms.

DCS Symptoms

One diver in the PFO Group and two divers in the Closure Group experienced transient skin rashes consistent with Type 1 DCS symptoms. One Closure Group diver cited a suspected and transient spinal DCS event.

Conclusions

No statistical difference between the mean annual dives of the PFO group and the Closure group following diagnosis and closure, respectively, was detected.

Divers with uncomplicated closures did more dives afterwards, while those with closure complications, recurrent symptoms, or requiring medical clearance did less dives.

Divers with PFO, who chose non-surgical management and did more dives than before diagnosis, used more oxygen-enriched breathing mixtures and limited their depth and time.

Limitations

This study is limited by the number of enrolled divers, which may fail to reveal differences in diving practices between those undergoing closure and those choosing non-surgical management. In addition, the lack of long-term follow-up may mask long-term improvements in diving symptomatology in those who are currently experiencing acute complications or lacking post-surgical medical clearance for diving. We will continue to follow this group and add additional divers to our study for these reasons.

Literature

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