1. Experimental setup

The general experimental setup of this work is shown in **Figure 1** and a description of the individual elements follows.

Tubes: In this work we used one "mother" silicon tube, which is 3 m long, 10 mm internal diameter and 1 mm wall thickness, and 6 "daughter" tubes of different sizes and materials, each 14 m long. These lengths were needed to allow for investigating a single reflection generated at the discontinuity between the mother and daughter tubes without the added complexity introduced by reflections from the end of the daughter tube. The daughter tubes were connected with the mother tube to form six sets, providing three positive and three negative reflection coefficients. For example, set A indicates the connection of mother tube with daughter tube A. The details of the daughter tubes used in this work are shown in **Table 1.** Daughter tubes A, B, C, and D were connected directly to the mother tube by overlapping ~ 1cm of the inlet of each daughter tube over the outlet of the mother tube, no connector used. Daughter tubes E, F were connected to the mother tube by overlapping the inlet of each over a short connecting tube of ~ 2cm, which in turn was connected to the mother tube, also through overlapping. The mother tube and each of the daughter tubes are uniform in both dimension and mechanical properties along its length. The mother tube was fully immersed in a water tank, where the water level was approximately 1 cm above its upper wall. All tubes were kept in the horizontal position.

Pump*:* The inlet of the mother tube was connected to a piston pump, which generated a reproducible approximately semi-sinusoidal single pulse wave with the piston moving forward from the bottom to top dead centre. The cylinder of the pump is 5cm in diameter and the stroke of the piston is 2cm; giving a displaced volume of approximately 40ml.

Reservoirs: The inlet of the mother tube and outlet of each of the daughter tubes were connected to an inlet and outlet reservoirs, respectively. The inlet and outlet reservoirs were connected and the height of the fluid in the reservoirs was adjusted to 10 cm above the longitudinal axis of the tube; producing an initial hydrostatic pressure of 1 kPa. The differences in mean transmural pressure for different-sized tubes were negligible. A one-way valve was placed between the outlet of reservoir and inlet of the mother tube, as shown in **Figure 1**, to ensure the entire displaced volume flowed into the mother tube.

Measurements: Simultaneous pressure and flow waveforms were measured at the same axial locations in the mother tube. Because the pressure catheter was only 1.2 m long, measurements were made every 10 cm from the inlet via the inlet connection and every 10 cm from the outlet via the outlet connector. Additional measurements were made every 5 cm in the 20 cm closest to the reflection site at the outlet of the mother tube. For each measurement of pressure and flow in the mother tube, the pressure was also measured in the daughter tube 10 cm downstream of the reflection site using another pressure catheter introduced through the Y junction connector, no stopcock in the connector.

Pressure, flow and outer diameter were measured using a 6F pressure transducer tipped catheter (Millar Instruments Inc., Houston, Texas, USA), an ultrasonic flow probe (Transonic System, Inc, Ithaca, NY, USA), and a paired set of ultrasonic crystals (Sonometrics Corporation, Ontario, Canada), respectively. External diameter and wall thicknesses of the tubes were measured using a digital calliper. The inner diameter, D, was determined by subtracting twice the wall thickness. All the data were acquired at a sampling rate of 500 Hz using Sonolab (Sonometrics Corporation, London, Ontario, Canada). Wave speed in the mother tube is 21.2 ± 0.8m/s, which was determined by the foot-to-foot method and confirmed by compliance and mechanical tests.

2. Data Sets

All the data are stored in the measurement folder, in this folder there are 6 sub folders which named by the daughter tubes' diameter and wall thickness, for example: folder A 8_2 contains all the measurements in set A, which the mother tube was connected to daughter tube 8 mm inner diameter and 2 mm wall thickness. Inside the folder, the data files are named by the daughter tube's diameter_wall thickness_measurement distance to reflection site_pressure+flow velocity/pressure+diameter1/2(measurements were taken as pressure and flow velocity simultaneously twice, then pressure and diameter simultaneously twice, so 1/2 indicates the first or second measurement), for example 8_2_100_PU1 means this is the first measurement of pressure and flow velocity simultaneously at 100 cm away from reflection site and the daughter tube in this set is 8 mm diameter and 2 mm wall thickness dimensions. In each folder, there are also two data files named as daughter tube's diameter_wall thickness_daughter tube_pressure+flow velocity1/2, for example 8_2_daughter_PU1 means this the first measurement of pressure and flow velocity simultaneously in daughter tube, unfortunately there was no pressure and flow velocity measurements in daughter tube in set B, and there was no pressure and diameter simultaneously measured in daughter tube in all sets.

In each data file, column A is time, column B and C are pressures, if measurement site is 210-290 cm away from reflection site, P1 (column B) was used to measure the pressure in the mother tube; if measurement site is 5-100 cm away from reflection site, P2 (column C) was used to measure the pressure in mother tube. Column D is flow rate, columns F and G are the diameter measurements.

Limitations: Due to technical difficulties, it was not possible to record reliable diameter measurements in some positions. For example, in sets D and F there were not reliable measurements in the last three positions near the reflection site. Further, In some positions we had only one good measurement so wave speed was calculated. In some cases, far from the reflection site, both measurements were not reliable and the nearest measurement was used instead.

Table 1 Daughter tubes properties and reflection coefficients. D_{in}: Internal diameter, h: Wall thickness, R_t: theoretical reflection coefficient and C: wave speed in daughter tubes.

Set	D_{in} (mm)	h (mm)	Material	R_t	C (m/s)
A	8	2	Silicone	+0.36	25.52
B	8	1	Silicone	+0.28	22.27
C	10	2	Silicone	+0.12	25.30
D	12	1	Silicone	-0.12	22.27
E	16.7	1.5	Rubber	-0.39	23.89
F	21	1.5	Rubber	-0.60	20.73

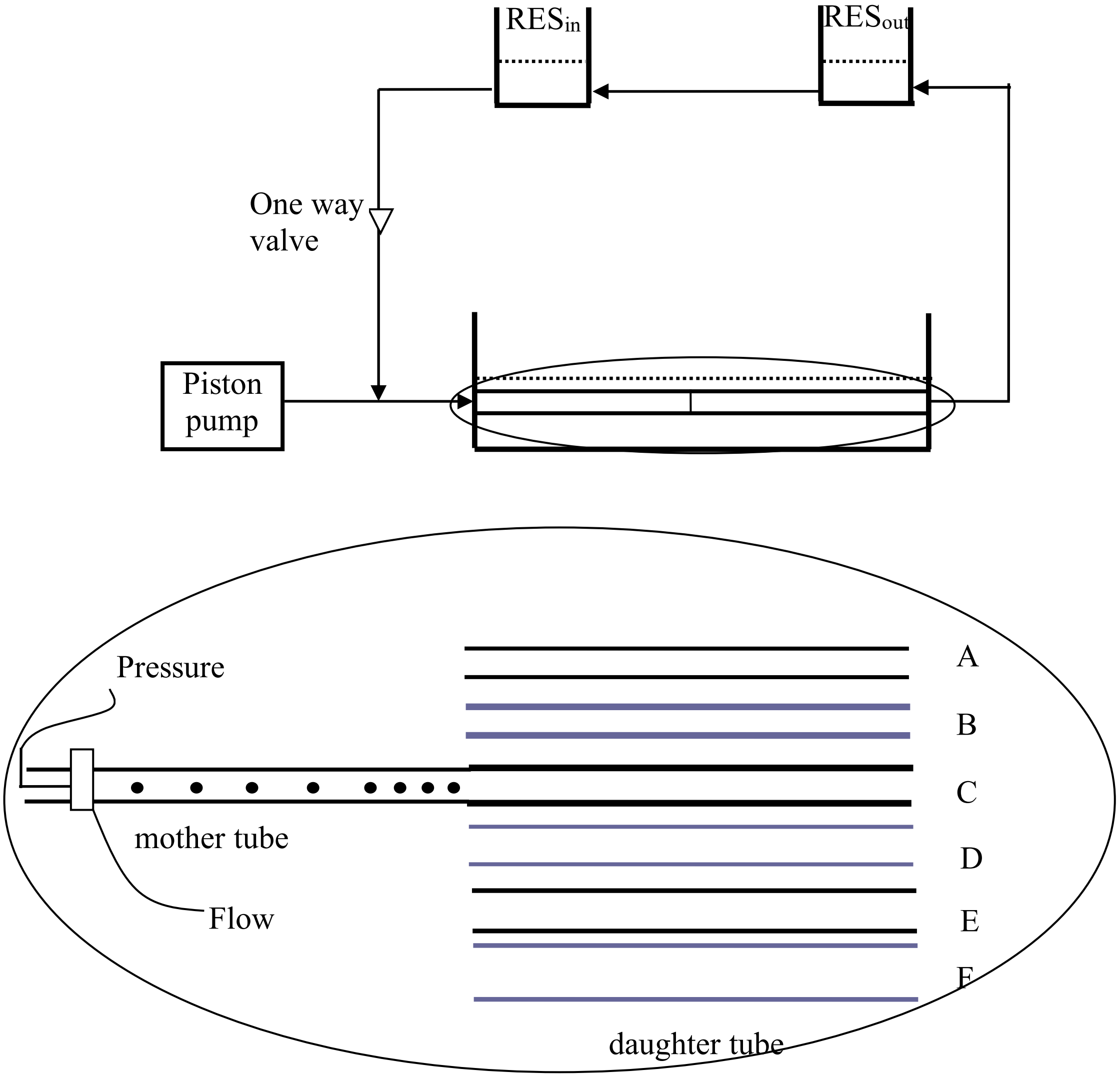

Figure 1: A schematic diagram of the experimental setup. RES$_{inlet}$ and RES$_{outlet}$ are the inlet and outlet reservoirs which provided the initial pressure to the system, and kept the tube free of air. Pressure and flow were measured using transducer tipped catheters, and ultrasonic

flow meter and probes, respectively. All elements of the experiment are placed on the horizontal plane so that the heights of the inlet and outlet reservoirs were equal.